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Original Communications

THE USE OF A BLOOD COAGULANT EXTRACT FROM THE HUMAN PLACENTA IN THE TREATMENT OF HEMOPHILIA

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RECENTLY Sakurai[1] called attention to the fact that the action of "placental toxins" in bringing about the coagulation of blood was similar to the coagulants which have been made from animal tissues (Wooldridge,[2] Loeb,[3] Howell,[4] Mills[5] and others). This investigator extracted fresh human placentas with 0.9 per cent NaCl solution. The slightly opalescent suspension of material obtained by centrifugation was effective in shortening the coagulation time of recalcified oxalated blood plasma of rabbits and dogs. The toxicity of the extract for animals was found to run parallel to the coagulant power. The activity was weakened or destroyed by oxidation, heat, proteolytic enzymes, and long exposure to air. The active principle was globulin-like in nature and contained 1.226 per cent phosphorus. When injected into the veins of animals in large amounts, it defibrinated the blood and at the same time was excreted into the urine with its coagulant power retained. The oral or subcutaneous administration shortened the coagulation time of the blood of animals in vivo and in vitro.

The purpose of this communication is to record observations on the effectiveness of a tissue protein prepared from human placentas in the treatment of hemophilia. Studies have also been made in an attempt to determine similarities or differences in the coagulating action on the blood of this preparation with other animal tissue extracts.

Before describing the technic which we have employed in preparing this extract, it is important to emphasize the distinction between

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this blood coagulant fraction of the human placenta and the antibody solution ("placental extract immunizing" or "immune globulin" [human]) described by McKhann and his associates[6] used for prevention or modification of measles and containing antibodies for poliomyelitis, scarlet fever, and diphtheria. The immunizing antibodies in the placenta may be prepared from placental serum as well as from repeated saline extractions of the organ. On the other hand, the blood coagulant fraction is definitely a protein derived from the placental tissues since placental serum contains but negligible quantities. The blood coagulant is a very insoluble globulin being easily precipitated in isotonic saline at pH 5. The antibodies for virus diseases (poliomyelitis) are found in this and all other globulin fractions. The antitoxins (scarlet fever and diphtheria) are found in the more soluble pseudoglobulin fractions made from extracts of the placenta.[7]

PREPARATION OF BLOOD COAGULANT FROM HUMAN PLACENTA

Placentas obtained from nonsyphilitic and nontoxic women were used. When possible, all operations were carried out in a cold room. The placentas were ground in a food chopper and extracted with ice-cold isotonic saline solution. A second extraction was made with distilled water rendered slightly alkaline so that the hydrogen ion concentration of the extract was about 8.5. The extractions were made by agitating the material for thirty minutes, and then filtering through cheesecloth. The extract was centrifuged to remove red cells and solid material and was then acidified with 0.1 N hydrochloric acid to pH 5 (blue green to bromcresol green after dilution with water). The heavy flocculant precipitate, which settled out readily on standing, represented the coagulant fraction. The precipitate was washed twice with water to remove the hemoglobin and salt and was taken up in distilled water and weak NaOH until the pH was about 7.5. Then 0.2 per cent $NaHCO_3$ was added and the pH readjusted to 7.5. One-half per cent tricresol was added as a preservative although this does not guarantee sterility. The nitrogen concentration of the final solution should be between 2 and 3 milligrams per cubic centimeter. The supernatant fluid from this isoelectric precipitation could be used for the preparation of placental extract for immunizing purposes ("immune globulin human").

The placental extract possessing coagulant activity was a turbid material of brownish color, which could not be put into true solution. It was precipitated in an acid medium, was difficultly soluble in dilute alkalies, and rapidly lost its potency in alkaline or acid solutions. The activity was greatly impaired by passage of the extract through Berkefeld or Seitz filters. The active material was also removed from suspension by passage through a Sharples centrifuge. The activity was destroyed by oxidation and by aging, particularly in the presence of fresh blood serum.

Since the placental extract does vary in its coagulant activity, it has been found necessary to check its potency frequently so that none but reasonably active extracts are used clinically.

The potency of the placental coagulant may be tested in vitro by its effect on the clotting time of recalcified, citrated, bovine plasma. At least 0.3 per cent sodium citrate is added to bovine blood and the plasma removed by centrifugation. The plasma may be kept in the cold for two or three weeks if 1:5,000 merthiolate is added.

One cubic centimeter samples of the plasma are pipetted into small test tubes which have been thoroughly cleaned and rinsed with iso-

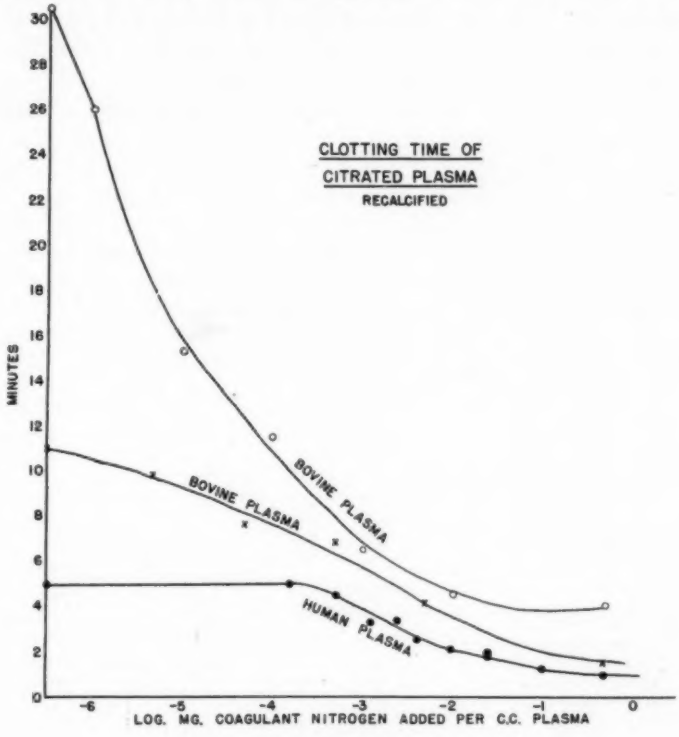

Fig. 1.

tonic saline before use. The plasma is allowed to come to room temperature. One-tenth of a cubic centimeter of the coagulant to be tested is added to the plasma. To this and to a control tube is added 0.3 c.c. of 2½ per cent calcium chloride. The time necessary to form a solid clot is ascertained. Determinations should be made in duplicate. Temperature, acidity, and calcium chloride concentration materially influence the coagulation time and should be carefully controlled.

If the control clots in fifteen minutes, the tube to which coagulant has been added should clot in two or three minutes. If the control

time is longer—for example, thirty minutes—the coagulant should clot the plasma in less than 5 minutes if it is to be regarded as sufficiently potent for use.

EFFECT OF BLOOD COAGULANT

When tested, it was found that the extract, when added to drawn, fresh citrated blood, shortened the coagulation time. Furthermore, the potency of the coagulant factor was found to be present even when the extract was employed in dilutions as high as 1:10,000. The relation of the concentration of the blood coagulant extract to the coagulation time of recalcified plasma is shown in Fig. 1, and from this it can be seen that the coagulation time of both bovine and human plasma is reduced in the presence of the placental coagulant extract.

As it has been suggested by Mills[5] and Loeb[3] that tissue coagulants may possess some degree of specificity for the species from which they are derived, in vitro studies were made with recalcified, citrated blood plasma from animals and humans. The reduction in the coagulation time of the human plasma was more marked when the placental coagulant extract was added. Similarly, the bovine lung extract was more effective in coagulating bovine plasma. Both extracts were made simultaneously in an identical manner and were of the same protein concentration. (Table I.) This would suggest some degree of species specificity and that human tissue extract might be more effective when employed as a coagulant in human beings.

TABLE I

COAGULATION TIME OF RECALCIFIED HUMAN OR BOVINE CITRATED PLASMA TO WHICH BOVINE LUNG COAGULANT EXTRACT OR PLACENTAL COAGULANT EXTRACT HAS BEEN ADDED

	TIME OF COAGULATION		
	CONTROL	LUNG EXTRACT ADDED	PLACENTAL EXTRACT ADDED
Human plasma A	9′56″	1′45″	1′10″
Human plasma B	10′23″	2′04″	1′19″
Human plasma C	10′50″	2′05″	1′24″
Human plasma D	9′10″	2′08″	1′35″
Bovine plasma A	14′25″	1′ 0″	2′10″
Bovine plasma B	19′45″	1′45″	3′05″
Bovine plasma C	12′35″	1′25″	2′36″
Bovine plasma D	13′29″	1′10″	2′18″

To 1 c.c. of plasma was added 0.1 c.c. coagulant extract (containing 1.5 mg. N per c.c.) and 0.3 c.c. 2.5 per cent $CaCl_2$.

Observations on the coagulation time of both the venous and capillary blood were made in rabbits by the intraperitoneal injection of 1 c.c. amounts of the extract. The coagulation time of the venous blood was determined by placing 1 c.c. amounts of blood obtained from the heart by a syringe into each of three tubes. The first tube was tilted at short intervals until coagulation was noted. The second

and third tubes which were not agitated clotted more slowly. The mean of the second and third tubes was taken as the coagulation time. The coagulation time of the capillary blood was determined by the method of Petersen and Mills[8] using capillary tubes. The results showed that there was a prompt reduction in the coagulation time of the blood of rabbits as obtained from the heart and as obtained by pricking the ear. This reduction persisted for periods varying between forty-eight and seventy-two hours. Following the administration of large doses of placental extract in animals, Sakurai noted the development of a negative phase, i.e., a period of time during which the blood was rendered noncoagulable. Such a phase did not occur in our animals with the dosage which we employed. The reaction of the animals varied according to the mode of administration of the extract. Intravenous injection into rabbits, guinea pigs, and monkeys resulted in death of the animal from intravascular coagulation, whereas subcutaneous, intramuscular, or intraperitoneal injections in small dosages were not lethal but shortened the coagulation times of both capillary and venous blood for variable periods. Large doses had a slowly toxic effect on all of these animals. The character of this toxic effect will be considered in a subsequent communication.

As the effectiveness of the material in reducing the coagulation time of the blood in animals had been demonstrated, it seemed desirable to note its effect in man. Therefore, after having determined the coagulation time of both the venous and capillary blood, 5 c.c. of the extract was administered orally to a normal individual after the manner as suggested by Mills[5] in the use of bovine lung extract. Thirty minutes later determinations of the coagulation time of both venous and capillary bloods showed that the clotting time of the venous blood had been reduced from six and one-half minutes to one and one-half minutes and that the clotting time of the capillary blood had fallen from two and one-half to one and one-half minutes. Examinations of the blood were then made at hourly intervals, and at the end of five hours it was observed that the coagulation times had returned to the normal levels. The duration of the effect in the normal human individual was thus found to be the same as Mills had observed under similar conditions following the use of bovine lung extract.

OBSERVATIONS ON PATIENTS WITH HEMOPHILIA

When in vitro comparisons were made between the blood of normal individuals and the blood from patients with hemophilia, it was found that the blood of the latter group coagulated just as rapidly and effectively as that from the normal group.

Fifteen patients suffering from hemophilia have been given the blood coagulant extract prepared from human placentas in order to determine the effect of the human tissue substance on the coagulation

time of the capillary and venous blood. In this series of cases the blood coagulant extract has been administered in two ways, orally and intramuscularly.

The oral administration of the extract has been preceded by a period of fasting in order to lessen various digestive enzymes in the stomach which tend to destroy the coagulant factor. For this reason it has usually been given before breakfast and preceded and followed by a small glass of ice cold water as this accelerates gastric motility. In view of the recent observations concerning the influence of oil of peppermint on the emptying time of the stomach,[9] we have added a few drops of the oil to the material at the time of ingestion. The extract has also been given orally in sodium bicarbonate and in alkaline carbonated water, and it would appear that it may be more readily absorbed from one of these mediums than from ice water. After the ingestion of the material it is advisable to allow from three to four hours to elapse before anything else is taken by mouth. Older children and adults, particularly, have seemed more resistant to the administration of the extract by mouth than have younger children.

The intramuscular injection of a sterile form of the blood coagulant extract has been employed only in those patients who have failed to show any response to oral administration. The gluteal region has been the usual site of the injection, and in no instance has it been followed by a reaction that would contraindicate its use in this manner. Care should be exercised when the extract is injected as it may produce intravascular coagulation should any of the material be given intravenously.

When administered orally, the effectiveness of the coagulant factor can usually be demonstrated within fifteen to twenty minutes by a reduction in the coagulation time of both the venous and capillary blood. The response following intramuscular injection, however, is slow, and several hours may be required before the full effect of the extract can be noted.

The dosage and frequency of treatment cannot be stated in a categorical manner as these may vary with each patient. In these studies we have given usually 5 c.c. orally, and, if there is no response, the amount is gradually increased by 5 c.c. until 15 to 20 c.c. are given. If there is still no response, from 10 to 15 c.c. are given two or three times in one day. Should the patient prove refractive to the oral administration, 5 c.c. of the extract are then given intramuscularly. In the majority of instances this dosage is adequate although on occasions it has been found necessary to inject 10 c.c. before a satisfactory response could be demonstrated. When more than 5 c.c. are given intramuscularly, it is advisable to inject the material into two sites. The duration of the effect of the extract, whether administered

orally or intramuscularly, varies with the individual patient. Therefore, in order to determine the frequency with which the material should be given, the coagulation time of both the venous and capillary blood should be noted each day. In this manner the time at which the coagulation time tends to return to its former level can be determined.

Eleven of the fifteen children with hemophilia who have been treated have shown a satisfactory response to either the oral or intramuscular administration of the extract as evidenced by a reduction of the coagulation time to within ten minutes, which we have taken as the upper limit of normal. Although in the other four instances there was a reduction in the coagulation time, the end point was not sufficiently

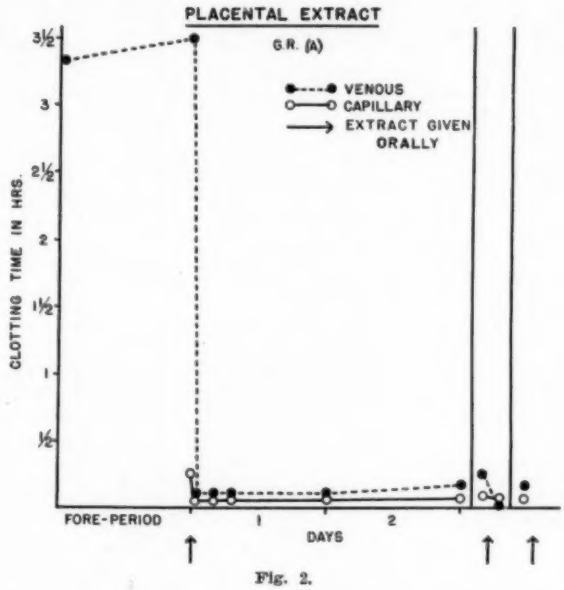

Fig. 2.

low for us to consider the effect as satisfactory as in the other group of cases. The effect of the blood coagulant extract by oral and intramuscular administration is shown in Table II. S. C. (Case 6) failed to respond to the oral administration but showed a prompt reduction in the coagulation time when the extract was given intramuscularly. It will be noted in Cases 11 and 14 that, although there was a marked reduction in the coagulation time, we were unable to reduce it to within normal limits. It should be pointed out that patients with hemophilia may show a variable response to the extract. This was especially true in Patients 2, 9, and 10 (Table II). This was probably due to a delayed emptying of the stomach or the result of poor absorption of the extract from the gastrointestinal tract.

TABLE II

HUMAN PLACENTAL TISSUE GLOBULIN: EFFECT IN PATIENTS WITH HEMOPHILIA

CASE	NAME	DATE	AGE	METHOD OF ADMINISTRATION	DOSAGE IN C.C.	COAGULATION TIME FORE PERIOD		COAGULATION TIME AFTER TREATMENT		DURATION OF REDUCTION TO NORMAL LIMITS
						CAP.	VEN.	CAP.	VEN.	
1	G. R.*	12/29/34	11	Oral	3.5	15′	3°30′	3′30″	5′45″	9 days
		1/ 6/35		Oral	3.0	5′	14′10″	4′20″	?	7+ days
		3/ 9/35		Oral with carbonated water	5.0	8′	16′	4′56″	9′	
2	W. C.	1/ 2/35	8	Oral	2.5	13′30″	2°30′	6′40″	15′	?
		1/18/35		Oral	5.0	28′10″	2°20′20″	9′20″	9′	30 hours
		1/21/35		Oral	10.0	10′30″	?	10′	52′	Slight effect
		1/22/35		Oral	7.0	?	?	14′	40′	No effect
		6/18/35		Intramuscular	5.0	21′	3°35′	9′	9′10″	36 hours
		6/23/35		Intramuscular	5.0	------	3°20′	------	10′	48 hours
3	D. M.	1/ 4/35	5	Oral	3.0	26′	2°30′	3′30″	3′30″	48 hours
		1/ 6/35		Oral	3.0	10′	?	5′20″	12′30″	72 hours
4	J. Mc.	1/11/35	18	Oral	3.5	7′12″	34′	3′20″		7 days
5	J. Mc.	1/11/35	10	Oral	3.5	7′50″	15′	3′39″	5′	7 days
6	S. C.	1/12/35	13	Oral	3.5	14′10″	1°10′	10′	40′12″	No effect by oral administration
		1/13/35		Oral	3.5	8′	45′	8′15″	38′	
		1/14/35		Oral	5.5	11′10″	40′	9′	40′	
		1/15/35		Oral	10.0	?	?	10′	45′	
		7/30/35		Intramuscular	5.0	39′	1°15′	7′	7′	
7	A. P.	1/17/35	15	Oral	6.0	21′40″	3°30′	10′10″	1°30′	No effect by oral administration
				Oral	10.0			9′10″	--------	
								10′	1° 5′30″	
		1/18/35		Oral	10.0	9′15″	1°15′	10′	1°10′	
					5.0	------	--------	------	--------	
					5.0	------	--------	------	--------	
					5.0	------	--------	------	--------	
		1/19/35		Oral	6.0	------	--------	10′	35′	
		1/20/35		Oral	10.0	10′	35′	11′20″	48′	
		1/21/35		Oral		------	--------	11′	1°	
		2/16/35		Oral	15.0	19′07″	1°15′(?)	17′	1°15′	
		2/17/35		Oral	10.0	------	--------	12′	48′	
		2/18/35		Oral	10.0	------	--------	17′20″	1°25′	

TABLE II—CONT'D

8	M. E.*	1/19/35	1½	Oral	5.0	33′	3°30′	10′	--------	9 days
		3/ 8/35		Oral with carbonated water	10.0	25′	3°30′	7′	15′	7 days
		5/ 2/35		Rectal	12.0	28′	2°50′	10′30″	10′30″	48 hours
		5/ 6/35		Rectal	20.0	20′	2°48′	8′	--------	48 hours
9	R. S.	2/22/35	8	Oral	5.0	15′	2°	7′	30′	2 hours
		2/23/35		Oral	20.0	15′	2°	15′	2°	No effect
		2/24/35		Oral	20.0	15′	2°	15′	2°	No effect
		2/25/35		Oral	5.0	15′	2°	9′	27′	6 hours
		2/28/35		Oral with soda	5.0					No effect
		3/ 1/35		Oral with carbonated water	10.0	------	--------	6′	16′	24 hours
		3/ 9/35		Oral with carbonated water	10.0	15′	2°	15′	31′	24 hours
10	R. S.	2/22/35	9	Oral	5.0	15′	1°40′	14′	1°38′	
		2/23/35		Oral	20.0					No effect
		2/24/35		Oral	10.0					
		2/25/35		Oral	5.0	------	--------	6′50″	37′	24 hours
		2/28/35		Oral with soda	5.0					No effect
		3/ 1/35		Oral with carbonated water	10.0	15′	1°40′	8′20″	17′	24 hours
		3/ 8/35		Oral with carbonated water	10.0	12′	1°	9′30″	1°	No effect
11	C. B.	5/10/35	4	Oral with fruit juice	5.0	18′	1°32′30″	10′	--------	
		5/11/35		Oral with carbonated water	5.0	18′	1°	9′	33′	24 hours
		5/16/35		Oral with carbonated water	5.0	18′30″	1°30′	10′	30′(?)	
12	L. M.	6/21/35	7	Intramuscular	3.0	23′30″	1°46′	7′20″	16′	24 hours +
		6/23/35		Intramuscular	5.0	22′	1°45′	------	12′	72 hours +
13	M. C.	7/17/35	5	Oral	5.0	------	20′	------	2′10″	6 days
14	J. C.	9/ 7/35	9	Oral	5.0	------	4°30′	------	4°30′	No effect
		9/ 9/35		Oral	15.0 A.M. and 15.0 P.M.	------	4°30′	------	18′	24 hours
		9/11/35		Oral	30.0 A.M. and 30.0 P.M.	------	40′	------	25′	24 hours
		9/15/35		Intramuscular	10.0	------	45′	------	1°40′	No effect
15	W. J.	10/18/35	5	Oral	7.0	------	1°15′	------	4′40″	72 hours

*Material administered repeatedly at definite intervals over a period of months has maintained blood coagulation time close to normal levels.

In Figs. 2 and 3 the reduction in the coagulation time of the capillary and venous blood when the extract was given orally with cold water is illustrated. Fig. 4 shows an immediate response when extract was given in cold alkaline carbonated water after there had been no response when the substance was given in plain cold water.

Inasmuch as large doses of placental extract in animals may result in a phase during which the blood is noncoagulable, the question has arisen whether or not the placental coagulant extract can be administered repeatedly over a long period of time without danger to the hemophiliac patient. The reports of two cases in detail will illustrate the amounts which have been given over a period of time. In both

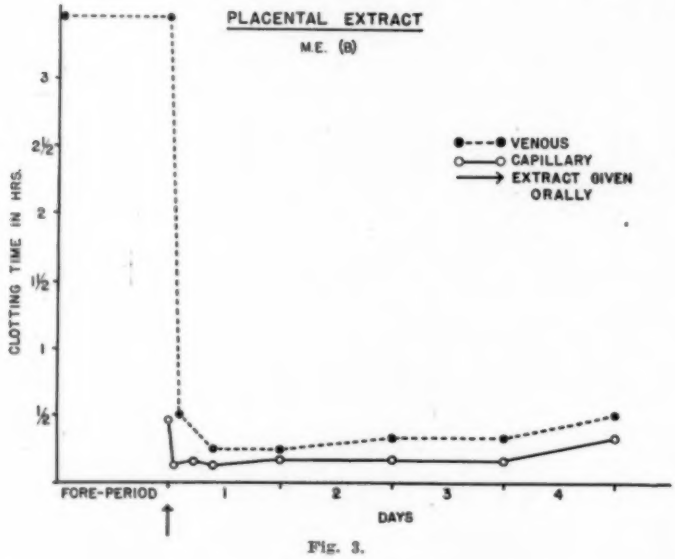

Fig. 3.

of these patients, ingestion of the extract at proper intervals has permitted the child to lead a normal, active life, despite minor cuts and abrasions which previously had been incapacitating.

CASE 1.—(Case 1, Table II.) G. R., a white male child, eleven years old, was first admitted to the hospital at the age of two years on account of prolonged bleeding from the tongue. The patient had bitten his tongue, and bleeding had persisted in spite of local applications of various hemostatic agents. Three blood transfusions were necessary to control the hemorrhage. The family history showed that one maternal aunt had had a male infant who died with hemorrhages and that a second male child had a marked tendency to develop hematomas and to bleed profusely following slight trauma. The past history of the patient revealed that black and blue spots or raised bumps were easily produced by any type of injury. In view of the family history, clinical course, and hematologic studies, a diagnosis of hemophilia was made.

From November, 1930, until December, 1934, the patient was treated by protein sensitization as advocated by Vines and Mills. During this time he appeared to be slightly improved although he continued to develop hematomas and hemarthroses from trauma and to bleed from loose, carious teeth.

Since December, 1934, the patient has received the placental coagulant by mouth in doses of 5 c.c. twice a week. The effect of a dose of extract by mouth is shown in Fig. 2. Frequent determinations of the coagulation time of both the venous and capillary blood throughout this period have shown them on each occasion to be within normal limits. In a period of seven months the child has received by mouth 650 c.c. of placental tissue coagulant without untoward effect. The clinical course has been uneventful, and quite in contrast to previous years which had been marked by the development of hematomas following slight trauma. On account of the ease with which hemarthrosis occurred, the patient had been unable to enjoy the usual activities of a child. During the past seven months he has participated in various forms of school activities, obtained a bicycle, and has enjoyed the usual

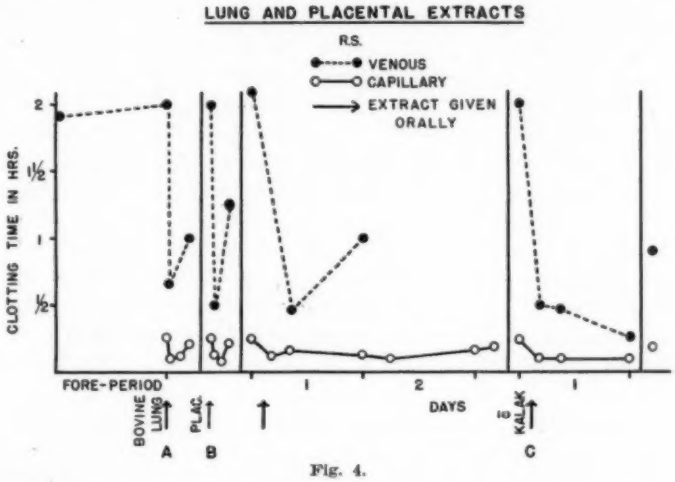

Fig. 4.

winter sports of his locality. On one occasion he pierced his tongue with a fork, producing four puncture wounds. This accident was not followed by hemorrhage. Formerly the loss of a carious tooth was accompanied by prolonged bleeding from the cavity, but this winter such unpleasant features have been absent.

Case 2.—(Case 8, Table II.) M. E., a white male child, was first admitted to the hospital when thirteen months old, on account of a marked tendency to develop ecchymotic areas and to bleed profusely after slight trauma. There was no family history of hemophilia. Following circumcision at one week of age, he bled profusely and had required several blood transfusions. Thereafter he showed a tendency to bleed for prolonged periods following slight trauma. The coagulation time of both the venous and capillary blood was prolonged. A diagnosis of hemophilia was made. Since the age of fifteen months the patient has received placental coagulant in a dosage of 5 c.c. by oral administration at various intervals—usually five days. The effect of the material by mouth is shown in Fig. 3. Throughout a period of eight months the coagulation times of both the venous and capillary blood have approached normal limits, and the patient has been free from hemorrhage, although

on two occasions he has suffered from lacerations of the face. Small ecchymotic areas have occurred occasionally. This child has received over 250 c.c. of placental coagulant during this period.

As the result of the experience with these two patients, it seems quite likely that the placental blood coagulant may be taken without detriment over a considerable period of time by the hemophiliac patient. However, before drawing too definite conclusions on this point, it will be necessary to obtain information on a larger series of cases. Whether a toxic effect would follow repeated doses in the normal person has not been satisfactorily established.

Whether or not the blood coagulant extract which reduces the coagulation time in hemophiliacs for periods as long as five to nine days will have an effect in arresting internal hemorrhages in these patients remains to be seen.

While the data herein reported are suggestive, they do not answer definitely the question as to whether the *homologous* nature of this coagulant renders it superior to the animal tissue coagulants now available. Mills was able to shorten the coagulation time of the blood in hemophiliac patients by the oral administration of bovine lung tissue extract, but this shortening was of only a few hours' duration. The brief duration of the effect of lung extract has been confirmed by trial of a commercial preparation of lung extract as well as by bovine lung tissue coagulant prepared in our own laboratory (Table III). The results with a heterologous protein derived from bovine lung tissue are in sharp contrast to the more prolonged effect following the administration of the homologous tissue extract derived from the human placenta.

TABLE III

BOVINE LUNG TISSUE GLOBULIN: EFFECT IN PATIENTS WITH HEMOPHILIA

NAME	DATE	METHOD OF ADMINISTRATION	DOSAGE IN C.C.	COAGULATION TIME FORE PERIOD		COAGULATION TIME AFTER TREATMENT		DURATION OF EFFECT
				CAP.	VEN.	CAP.	VEN.	
J. Mc.	2/2/35	Oral	5	6'30"	10'	4'45"	9'	6 hours
R. Sm.	2/20/35	Oral	5	15'	2°	6'20"	40'	3 hours
R. Sp.	2/20/35	Oral	5	15'	1°40'	10'	1°40'	
M. E.	5/10/35	Rectal	20	13'	2°30'	13'	2°30'	No effect
G. R.	5/16/35	Oral	5	12'	40'	10'30"	35'50"	

The potency of the blood coagulant extract when applied to the tissues locally has been noted in the treatment of normal individuals following traumatic injuries and certain postoperative hemorrhages, notably bleeding following tonsillectomy and adenoidectomy. The local action of placental tissue extract in a patient with hemophilia is illustrated in the following case report.

CASE 3.—R. S., a known hemophiliac child, was admitted to a neighboring hospital because of a laceration of the scalp which was bleeding profusely. Despite a

transfusion and the local application of various commercial thromboplastic substances, the bleeding from the wound continued for three days. At the end of this time a piece of cotton saturated with placental extract was placed firmly over the wound and within five minutes coagulation occurred without subsequent oozing.

SUMMARY

Tissue protein extracts prepared from the human placenta have been found to have the same type of effect in the control of local hemorrhage as has been reported from the use of animal tissue extracts. However, a striking difference has been observed in the results with this extract and those reported from the use of animal tissue preparations in the treatment of patients with hemophilia. Animal tissue extracts have shortened the coagulation time of the blood of patients with hemophilia for very brief periods, whereas human placental extracts have reduced the clotting time of both venous and capillary blood for periods varying from forty-eight hours to as long as nine days. Despite repeated slight trauma incident to active childhood, two children with hemophilia have been able to lead normal, active lives for periods of several months by the continued administration of this material at carefully regulated intervals.

In the relatively small series of patients with hemophilia herein reported, the blood coagulant extract has been well tolerated by oral administration or by intramuscular injection. It must be emphasized that this blood coagulant extract is fatal when injected intravenously in small laboratory animals. Therefore, in using this material in patients with hemophilia, intravenous injection must be avoided as by this route unfortunate, if not fatal, results might ensue.

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ACUTE LYMPHOCYTIC MENINGITIS?

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MY ATTENTION was first attracted to this disease by its rapid spread in an orphanage which housed 360 male children from three to sixteen years of age and sixty-five adults. The first child to become ill with the symptoms to be described later was admitted to the hospital cottage on Aug. 1, 1935, and within twenty-one days a total of seventy children had been hospitalized (Chart 1). The symptoms and signs exhibited were so unusual and so strikingly similar that they may be grouped in the order of their importance as follows: (1) *Headache:* This was marked and always present. In most cases it was frontal in position and often so excruciating that drugs did not afford relief. It was aggravated by motion, and when the patients were in a standing position they sometimes became dizzy. (2) *Anorexia With Nausea or Vomiting:* All seventy children had at least anorexia and nausea, while the majority vomited as well. Six children had diarrhea. (3) *Sore Throat:* Many of the children complained of sore throat of varying severity. Although this condition did not seem to trouble them, objective examination showed that there was involvement of the pharyngeal wall of every patient, ranging from a diffuse inflammatory reaction to localized spotty points of inflammation. Islands of minute lymphoid tissue jutted out from the pharyngeal wall and soft palate. Only a few children had cervical lymphadenopathy. Four patients had herpes labialis. (4) *Epigastric Pain:* Every child had pain when light or deep vertical palpation was employed in the epigastric region roughly corresponding to Mackenzie's area of referred pain for duodenal ulcer. At least one half of the children had more diffuse pain, and this was found always in the midline between the ensiform cartilage and the umbilicus. (5) *Temperature:* The highest temperature recorded was 104.3° F. and the lowest 99° F., while the average was from 100° to 101° F. In one case, the temperature became normal in two days; in 42 cases, in three days; in 12 cases, in four days; in 10 cases, in five days; in 4 cases, in six days; and in 1 case, in seven days. (6) *Pain Over the Eyes:* About twelve of the patients had pain on palpation of the eyeball, and twenty complained of subjective pain in the eyes. (7) *Spinal Fluid Findings:* In one child with an intractable headache

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unrelieved by medication, the spinal fluid was withdrawn as a therapeutic procedure. The headache disappeared following this therapy. The fluid contained 180 cells per cubic centimeter, all of which were lymphocytes, and the Pandy test was negative. Another puncture was done on this boy the next day. The results were comparable. In all, lumbar punctures were made on eighteen patients. All but

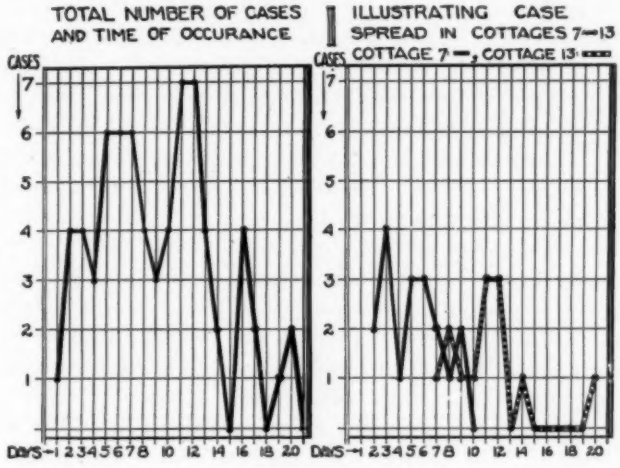
TOTAL NUMBER OF CASES
AND TIME OF OCCURANCE
ILLUSTRATING CASE
SPREAD IN COTTAGES 7—13
CASES
COTTAGE 7 —, COTTAGE 13
DAYS 1 2 3 4 5 6 7 8 10 12 14 16 18 20

Chart I.

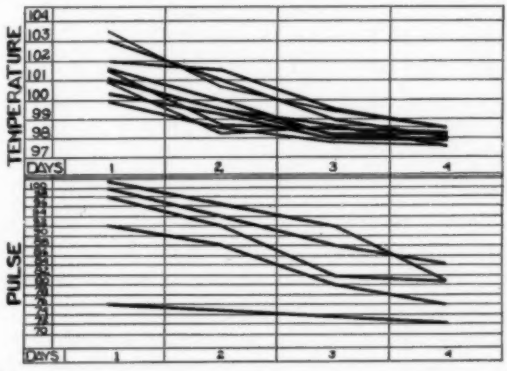

Chart 2.—Temperature in ten and pulse in five cases of lymphocytic meningitis.

two children who had the disease for five days had pleocytosis of the lymphocytic type. In one instance, the lymphocytes merely predominated in the first spinal fluid specimen withdrawn. The cell counts ranged from 25 to 350 cells per cubic centimeter. The Pandy reaction was usually negative, and at best, only faintly positive. This finding was so curious that fresh Pandy solutions were made and the

spinal fluids tested again. Spinal fluids that contained as many as 180 cells showed but a faint trace of globulin. When the cell count was higher than that, the Pandy reaction could be read as a possible one-plus reaction. This was probably due to the cellular elements themselves rather than to any free globulin fraction. In decided contrast, four-plus Pandy reactions are often found in the spinal fluids of tuberculous meningitis cases—fluids that have a low cell count. In a recent case of postvaccinal encephalitis with a cell count of only 21, the reaction to the Pandy test was four-plus when only one drop of the solution was added to the spinal fluid. It was found that the pleocytosis was not always present the first day of the disease, but invariably on the second or third day, usually when the child was better clinically. (8) *Blood Picture:* Total white and differential blood counts were made in the eighteen cases mentioned above. The total counts were low, ranging from 3,200 to 5,000. Only one was abnormally high. In ten of the eighteen cases there was a relative lymphocytosis, the latter cells being nearly as numerous as the leucocytes and sometimes outnumbering them. Sample lymphocyte counts from four cases were 58 per cent, 64 per cent, 67 per cent, and 72 per cent of the total white cell counts. These patients were nine, seven, eleven, and seven years of age, respectively. (9) *Culture of the Throat on Blood Agar:* Not all cultures were taken at the onset of the illness, but a hemolytic streptococcus was isolated in each of ten of the eighteen cases mentioned above, i.e., cases cultured early. Throat cultures taken from a comparable number of children throughout the village were negative for hemolytic streptococcus. (However, in thirty subsequent cases seen elsewhere, only five cultures showed hemolytic streptococci on blood agar plates.) (10) *Neurologic Examination:* Because of the headaches, all of the children were examined neurologically. In no instance was there any sign of meningeal irritation, although at times there was pain in the neck when the head was forcibly flexed on the chest and some subjective pain in the back. The normal reflexes were not modified nor were pathologic ones present. No sign of muscular weakness was present.

Clinical Course.—The disease was explosive in character, and the patients were well within a few days after the onset. There were no complications or sequelae. In a few cases, headache persisted for several days.

Second Attacks.—Two boys were readmitted with the same symptoms a few days after their first release from the hospital.

Adults.—Five of the sixty-five adults living in the orphan home contracted the disease. They showed symptoms and signs similar to those had by the children. Lumbar punctures were not permitted.

Contagiousness.—The contagiousness of the disease is obvious when the case spread in cottages 7 and 13 is studied (Chart 1).

Other Cases.—This epidemic was not a local one, for I have seen thirty other cases with the same symptoms in widely separated areas of Cleveland. In two cases in which lumbar puncture was permitted, the spinal fluid findings were likewise similar. Isolated cases with the same symptoms and signs have been seen in previous years, but information on the blood smears and spinal fluid findings is lacking save for one patient seen in 1934, who had findings similar to those seen in the epidemic described here. Higher white counts (from 8,000 to 10,000) have often been found in the second group of thirty cases mentioned, but irrespective of this, in most instances there was a relative increase in the number of lymphocytes. Twenty-five cases that might have been similar to ours have been seen by Currier,[1] fourteen by Ashton,[2] and fifty-five cases of a peculiar poliomyelitis without paralysis have been noted by Lucchesi.[3]

Treatment.—Each patient was given a cathartic, a liquid diet, and put to bed for four or five days. If patients got up before this time, they often had a return of the headache. Codeine or, in severe cases, lumbar puncture controlled the headache.

Discussion.—These cases might have been (a) types of encephalitis, (b) abortive poliomyelitis, (c) a form of infectious mononucleosis (Glanzmann[4]), (d) acute aseptic meningitis of Wallgren,[5] benign lymphocytic choriomeningitis of Armstrong and Dickens,[6] benign meningitis of Rivers and Scott,[7] or (e) a new disease syndrome. It could not have been encephalitis since there was absolutely no subjective or objective signs of this disease—no diplopia, no tic, no evidence of an upper motor neurone response, no hyperactive reflexes, no lost abdominal reflex, etc. It could not have been poliomyelitis or polioencephalomyelitis since no child showed any muscle weakness or paralysis, any diminution or modification of the reflexes—abdominal, tendon, or otherwise. One would expect to find at least some lower motor neurone findings if all these cases were poliomyelitis. In our series of nearly 700 cases of poliomyelitis, there were but few patients who had any objective evidence of throat involvement, while all of these children had involvement of the lymphoid tissue in that area. Convalescent serum withdrawn from five of the patients during convalescence from the disease showed no increase in neutralizing antibodies for the poliomyelitis virus when the *M. rhesus* monkey was used as the test animal. Although no virus could be found in the nasal washings of eight children, this does not rule out the presence of a virus as the causative factor.

This syndrome might have been a form of infectious mononucleosis, as there are records of spinal fluid pleocytosis of large mononuclears in

the latter disease, but ordinarily, patients who contract it do not have intractable headaches. Likewise, the syndrome described in this paper showed no glandular enlargements.

These cases might be placed in the same category as those described by Wallgren,[5] later by Viets and Watts,[8] Armstrong and Dickens,[6] and Rivers and Scott.[7] The one distinctive difference is that most of the cases described here presented a blood picture that is not found in acute aseptic meningitis. The causative factor of aseptic meningitis has been shown by Rivers and Scott,[7] and Armstrong and Lillie,[9] to be a filtrable virus, which was found to be similar to the one found by Traub[10] in mice. One wonders whether Kessel's[11] virus strain may not belong in the same category.

It would seem that the lack of glandular enlargement, the finding of spinal fluid pleocytosis, and the changes in the blood picture would be distinctive enough to label this entity a new syndrome, and I had tentatively termed it "acute epidemic lymphocytosis," but then again it may be that I have merely seen a more severe form of acute lymphocytic meningitis or more cases of this known entity, all the characteristics of which hitherto have not been described.

COMMENT

The minute lymph follicles of the throat were definitely swollen. The disturbance of lymphocyte cell count, always present in the severely ill patient, was striking enough to warrant the inclusion of the word lymphocytosis in any name given to the syndrome. It could not be said that all of the children had sore throats since less than half of the children were conscious of the condition of their throats, while those who did complain of angina were better within twenty-four hours. The pain in the epigastrium was obvious enough, but like the headache was probably secondary to the original cause of the disease. This disease could be visualized as an infection entering the human system by way of the gastrointestinal tract, irritating the throat tissue in passage and later the gastrointestinal tract itself and causing anorexia with either nausea or vomiting or both, local pain, and headache due to irritation of the peripheral ends of the sympathetic and vagus nerve fibers—a disease that in a certain percentage of cases causes a relative increase in the number of circulatory lymphocytes. Whether there are actual inflammatory changes in the meninges, or whether there is a vascular defect with increased permeability which allows lymphocytes to pass over into the spinal fluid are questions that remain unanswered. Of significance, however, is the absence or small amount of protein elements in the spinal fluid in the majority of these cases.

CONCLUSION

This paper describes an epidemic of a disease, the symptoms of which are excruciating headache; anorexia with nausea or vomiting or both; pain in the epigastrium on palpation; a low grade fever; a throat moderately or severely inflamed; some pain on movement of the head; a total white count, perhaps lower than usual, but if normal, in most cases, with a relative increase in the circulatory lymphocytes; negative neurologic signs; a spinal fluid pleocytosis with lymphocytes predominating in the severely affected case; and a hemolytic streptococci that was easily isolated from the throats of a small percentage of the cases. It would seem that this may be a new syndrome or a more severe manifestation of acute aseptic meningitis. It should be kept in mind and differentiated from poliomyelitis.

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THE ANTIRACHITIC VALUE OF IRRADIATED EVAPORATED MILK AND IRRADIATED WHOLE FLUID MILK IN INFANTS

(An In-Patient Study)

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THIS study was carried out to gather further data concerning the prophylactic antirachitic value of directly irradiated evaporated milk and of irradiated whole fluid milk, both similarly rendered antirachitic and containing approximately the same number of rat units of vitamin D. In a previous study[1] we have reported that irradiated evaporated milk "appeared to be an adequate agent for the prevention of rickets in negro infants" and that "it also appeared to be an unreliable agent for the cure of rickets in negro infants." Gerstenberger and his associates[2] have demonstrated that irradiated milk will produce healing of the rachitic bony changes fairly regularly in from ten and one-half to eleven weeks. We are convinced that vitamin D-fortified milks will not find their greatest usefulness in the cure of rickets if it takes as long as eleven weeks to effect this cure, an end which may be obtained much more rapidly using some of the more potent available sources of vitamin D. Consequently we have concerned ourselves more with the prophylactic value of irradiated milks.

The evaporated milk and the whole fluid milk used in this study were both directly irradiated. Assays of the evaporated milk both at the beginning and end of the study showed that it had a vitamin D content of 125 U.S.P.* units per 14.5 ounce can and that there was no change in the vitamin D content over the period of the study. The fluid milk was assayed at monthly intervals throughout the study and found to have a fairly constant vitamin D content of about 140 U.S.P.† units of vitamin D per quart.

Nineteen infants were selected for this investigation. These were all white infants, under twenty-four weeks old. Table I shows the age distribution of the infants. All were free from evidences of syphilis and tuberculosis. An attempt was made to select nonrachitic infants, but it was found that one infant had mild rickets, and two infants had questionable x-ray evidences of very mild rickets at the beginning of the study.

From the Children's Hospital of Philadelphia.

*45 Steenbock units.

†50 Steenbock units.

TABLE I

AGE DISTRIBUTION OF INFANTS

AGE IN WK.	NO. OF INFANTS
1 – 4	2
5 – 8	5
9 – 12	8
13 – 16	2
17 – 20	1
21 – 24	1

Fourteen of the infants were kept in a large isolated hospital ward during the entire period of the study. The remaining five infants were housed in a small isolated ward for two months and were then discharged because it appeared impossible to prevent cross-infections. Three of the five were followed as out-patients at weekly intervals, but two lived too far from the hospital to permit of their frequent returns.

The in-patients were not taken outdoors, and, since the study was carried out from December, 1934, to May, 1935, the antirachitic effect of the sunlight coming through the glass windows of the ward was practically negligible.

Complete histories, physical examinations, blood counts, and urinalyses were performed on each infant at the beginning and end of the study. Measurements of length, circumferences of head, chest and abdomen, and sizes of fontanelles were recorded at monthly intervals.

Muscular development and tonus, time of eruption of teeth, sitting, standing, and walking were recorded as evidences of physical development. Each infant was weighed daily and a record of daily milk intake was kept. At monthly intervals physical examinations were made for evidences of rickets. At the same time as the physical examinations, blood was withdrawn for the determination of the calcium and the phosphorus contents, and roentgenograms of an arm and leg were taken. The roentgenograms were read by Dr. Ralph Bromer, roentgenologist to the Children's Hospital, and independently by the authors.

The infants were divided into two groups: one group of ten infants was placed upon irradiated evaporated milk, and nine infants were given irradiated whole fluid milk. The ten infants receiving irradiated evaporated milk were in the ward during the entire period of study, while of the nine infants fed irradiated whole fluid milk, four were in the ward during the entire study (four and one-half months) and five were on the ward for only two months.

The feeding schedule employed was the following: the irradiated evaporated milk was diluted equally with water, and 5 per cent of

dark corn syrup was added. Five per cent dark corn syrup was also added to the undiluted irradiated whole fluid milk. These milk mixtures were offered to the infants on the basis of 55 calories per pound of expected body weight. Cereals and vegetables were added to the dietary when an infant attained the age of six months. Two antiscorbutic agents were fed, a different one to alternate infants in each of the two groups, viz., orange juice and cevitamic acid. Two and five-tenths cubic centimeters of orange juice were fed per pound of expected body weight. The cevitamic acid was dissolved in 10 per cent dark corn syrup so that each ounce contained 10 mg. of the acid. This was also fed in quantities of 2.5 c.c. per pound. Ferric ammonium citrate was added (2 per cent) to both the orange juice and the cevitamic acid solution.

TABLE II

LACK OF AGREEMENT BETWEEN CLINICAL AND ROENTGENOGRAPHIC EVIDENCES OF RICKETS

INFANT	AGE (MO.) AT TIME OF DIFFERENCE	CLINICAL SIGNS OF RICKETS			X-RAY EVID. OF RICKETS	BLOOD (AV.) VALUES		COURSE OF INFANT
		CRANIOTABES	BEADING OF RIBS	ENLARGEMENT OF WRISTS		CA	P	
C	2-5	Moderate	0	0	0	11.1	5.5	Craniotabes disappeared entirely by 6 mo. Never any other rachitic phenomena. Development normal.
D	3-7	0	Mild	0	0	10.3	7.7	Beading appeared after 1 mo. on ward. Did not progress. No other evidence of rickets. Development normal.
J	4-7	0	Mild	0	0	10.9	6.3	Beading noted after 2 mo. on ward. Did not progress. No other evidences of rickets. Development normal.
P	3-5.5	0	Mild	0	0	11.5	7.4	Beading noted on ward. Did not progress. No other evidences of rickets. Development normal.
V	3.5-4.5	0	Mild	0	0	11.2	6.5	Beading noted after 3 mo. on ward. Did not progress. No other evidences of rickets. Development normal.

RESULTS

For reasons which we have pointed out in our previous study, we again used the roentgenographic evidence of rickets as our final criterion of the presence or absence of rickets. In five of the infants there were present some clinical signs of rickets while roentgenographic bone changes indicative of rickets were absent (Table II). In these five infants the blood calcium and phosphorus values were normal at the time the clinical signs were noted.

In Table III are summarized the results in the ten infants who were fed irradiated evaporated milk. Two of these infants (J and M) had very questionable rachitic bone changes at the beginning of the study, the remaining eight (C, D, F, G, K, O, P, and V) were free from rickets. After one month roentgenograms showed that all were nonrachitic, and the entire group remained normal for the entire period of the study, four and one-half months. During this time blood calcium and phosphorus values were all normal, and physical development and growth were satisfactory as Table III shows.

In Table IV are summarized the courses of the nine infants who were fed irradiated whole fluid milk. Four of these infants (E, N, Q, and R) were in the ward the entire four and one-half months and remained free from rickets during the entire period. Two infants (L and X) were on the ward for two and one-fourth and two and one-half months, respectively, and because they were only three months old on discharge the data concerning them may not be as significant. However, they at no time exhibited any rachitic phenomena. Their physical examinations, roentgenograms, and blood calcium and phosphorus values were normal. Of the three infants who were on the ward for two months and out-patients for two and one-half months or more, two (H and T) had no evidence of rickets at any time. On admission one of these three infants (S) had a mild rickets which began to heal (by roentgenographic evidence) in thirteen weeks and was healed at the end of the study. At the time when the bones showed rachitic changes by roentgenogram and there was a moderate craniotabes, the blood calcium and phosphorus values were normal. Hess and his coworkers[3] have pointed out, however, that the blood calcium and phosphorus concentrations could be normal in the presence of mild rickets. While healing was complete in this infant after eighteen weeks, it took thirteen weeks before healing was initiated.

The administration of iron did not seem to influence the hemoglobin level significantly in any of the infants.

Both antiscorbutic agents, orange juice and cevitamic acid, functioned equally well in preventing scurvy, as far as we could determine from physical examination and roentgenograms.

TABLE III

INFANTS ON IRRADIATED EVAPORATED MILK

INFANT	TIME STUDIED			GAIN IN WEIGHT	GAIN IN LENGTH IN INCHES	AVERAGE INTAKE OF VIT. D PER DAY U.S.P. UNITS	ABSENCE OR PRESENCE OF RICKETS	BLOOD CHEMISTRY (AVERAGE)		DEVELOPMENT
	AGE	MO. STUDIED	MO. ON WARD					CA	P	
C	2-6½	4½	4½	4 lb. 10 oz.	4½	104.0	No evidence of rickets at any time	11.2	5.6	Well developed. Sat up at 6½ mo.
D	2-7	4¾	4¾	7 lb.	4¾	118.0	No evidence of rickets at any time	10.1	6.4	Sat up at 5½ mo. Had 6 teeth at 6 mo. Stood with support at 7 mo.
F	2½-7	4½	4½	5 lb. 10 oz.	5½	128.0	No evidence of rickets at any time	11.2	7.0	Could sit up and had 2 teeth at 6 mo.
G	4-8½	4½	4½	6 lb. 12 oz.	5	139.0	No evidence of rickets at any time	10.7	6.7	Stood unsupported and had 4 teeth at 8½ mo.
J	2-7	4¾	4¾	7 lb. 14 oz.	5	142.5	Very questionable x-ray change at 2 mo. Normal thereafter	10.8	6.5	Sat up at 5½ mo. Had 2 teeth at 7 mo.
K	2-6½	4½	4½	5 lb.	3½	119.5	No evidence of rickets at any time	11.2	6.7	Sat up at 5½ mo.
M	3-7½	4½	4½	7 lb. 3 oz.	3½	121.6	Very questionable x-ray change at 3 mo. Normal thereafter	10.4	6.4	Sat up at 6 mo. 2 teeth at 6½ mo.
O	3-7½	4½	4½	6 lb. 13 oz.	3¾	130.2	No evidence of rickets at any time	10.5	6.3	Had 2 teeth at 6 mo. Stood up with support at 7 mo.
P	1-5½	4½	4½	8 lb.	5½	128.0	No evidence of rickets at any time	11.3	7.4	Sat up at 5½ mo.
V	½-4½	4	4	5 lb. 12 oz.	3	129.0	No evidence of rickets at any time	10.9	6.8	Sat up at 4½ mo. Well developed

TABLE IV

INFANTS ON IRRADIATED FLUID MILK

INFANT	TIME STUDIED				GAIN IN WEIGHT	GAIN IN LENGTH IN INCHES	AVERAGE INTAKE OF VIT. D PER DAY U.S.P. UNITS	ABSENCE OR PRESENCE OF RICKETS	CHEMISTRY (AVERAGE)		DEVELOPMENT
	AGE	MO.	WARD (MO.)	O.P.D. MO.					CA	P	
E	2½-7 mo.	4½	4½	0	5 lb. 4 oz.	4½	127	No evidence of rickets at any time	10.9	6.8	Had 2 teeth and sat up at 6 mo.
H	1-6 mo.	5	2	3	6 lb. 11 oz.	4	100.1	No evidence of rickets at any time	10.9	6.6	Sat up at 5 mo.
L	1-3¼ mo.	2¼	2¼	0	2 lb. 5 oz.	1¼	105	No evidence of rickets at any time	11.2	6.8	Well-developed infant on discharge
N	2-6½ mo.	4½	4½	0	7 lb.	4¾	120.5	No evidence of rickets at any time	11.0	6.4	Sat up at 6 mo. Had 2 teeth at 6½ mo.
Q	2-6½ mo.	4½	4½	0	7 lb. 12 oz.	5	136	No evidence of rickets at any time	10.7	6.4	Sat up at 6 mo.
R	5½-10 mo.	4½	4½	0	4 lb. 9 oz.	4	145	No evidence of rickets at any time	10.9	5.7	Had 4 teeth and could walk at 10 mo.
S	3½-8 mo.	4½	2	2½	7 lb. 11 oz.	4½	136	On admission had craniotabes and x-ray evidence of mild rickets. Beginning healing 13 wk. Healed in 4½ mo.	10.2	6.6	Sat up at 5½ mo. Had 2 teeth and stood up at 8 mo.
T	1-5½ mo.	4½	2	2½	6 lb. 11 oz.	4½	118	No evidence of rickets at any time	11.2	7.4	Had 2 teeth at 5 mo. Sat up at 5½ mo.
X	½-3 mo.	2½	2½	0	3 lb. 4 oz.	1¾	114	No evidence of rickets at any time	11.4	5.9	Well-developed infant

DISCUSSION

From the data presented in Tables III and IV, it would appear that irradiated evaporated milk containing 125 U.S.P. units per 14.5 ounce can and irradiated whole fluid milk containing 140 U.S.P. units per quart, functioned equally well in preventing rickets when they were the sole source of vitamin D in the diet. The slight difference in vitamin D content is obviously of no significance so far as the protection afforded the infants in the two groups is concerned since the infants fed irradiated evaporated milk had an average daily intake of 123.9 U.S.P. units of vitamin D daily and those on irradiated whole fluid milk took 122.4 U.S.P. units daily. The variations in the vitamin D intake of the infants in the two groups were as follows:

Irradiated evaporated milk—104-142.5 U.S.P. units daily.
Irradiated whole fluid milk—100-145.0 U.S.P. units daily.

The slow healing of mild rickets in patient S by means of irradiated whole fluid milk emphasizes a fact which was evident in a larger group of a previous study:[1] namely, that a milk which contains approximately a minimum number of units of vitamin D for the protection of most infants (when it is the sole antirachitic source) will act as a slow, and therefore unsatisfactory, healing agent.

Proper therapeusis, or rapid healing, probably requires an antirachitic potency greater than either of the two sources here studied.

CONCLUSION

There are presented the results of a study of nineteen white infants (averaging two months in age) to determine the prophylactic antirachitic value of irradiated evaporated milk containing 125 U.S.P. units of vitamin D per 14.5 ounce can, and of irradiated whole fluid milk containing 140 U.S.P. units per quart.

No roentgenographic evidences of rickets developed during the period of study, four and one-half months.

The irradiated evaporated and whole fluid milks appeared to be equally efficacious in preventing the development of rickets.

In one infant in whom mild rickets was present at the beginning of the study, healing began in thirteen weeks and was complete in eighteen weeks. It should be emphasized, therefore, from this and previous studies, that irradiated milk alone cannot be relied upon for the rapid healing of rickets.

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IRRADIATED EVAPORATED MILK IN THE PREVENTION OF RICKETS

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IRRADIATED evaporated milk is now being used extensively in both the United States and Canada. Rapoport, Stokes, and Whipple[1] in a recent report concluded that irradiated evaporated milk seemed to be an adequate agent for the prevention of rickets. In this test which extended over a period of four and one-half months, actively growing negro infants living in a hospital were used, and all the milk that they received was irradiated evaporated milk. The presence or absence of rickets was diagnosed by x-ray examination. No other investigations on the antirachitic value of this milk have as yet been reported.

During the past year we have investigated the value of irradiated evaporated milk in the prevention of rickets. One hundred and three infants attending the infant welfare clinics in Toronto were observed for a period of five months. The observations were started in October and November and concluded in March and April. The infants all lived in their own homes, and the parents were largely of British descent. The milk feedings, which consisted of irradiated evaporated milk, water, and sugar only, were regulated by the clinic physicians. The amount of irradiated evaporated milk used varied from 6 to 20 ounces daily, depending on the caloric requirements of the infant, although very few of them received more than 16 ounces. At five to six months of age cereal was added. During the last month of the period of observation, five infants received egg yolk. The ages of the infants at the initial examination in October and November varied from one to six months (Table I). Seven of the infants had been premature, their birth weights ranging from 3.2 to 4.7 pounds.

Table I

Ages of Infants in Months at Time of Initial Examination

Group	Under 1 mo.	1 mo.	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.	Totals
Irradiated evaporated milk	0	19	20	24	17	19	4	103
Ordinary evaporated milk	1	12	10	14	7	6	2	52
Ordinary pasteurized milk	0	7	12	16	9	7	1	52

From the Department of Paediatrics, University of Toronto, and the Hospital for Sick Children.

Three times during the five months the infants attended a special clinic at the Hospital for Sick Children for physical and x-ray examination. The infants were weighed and carefully examined for evidences of craniotabes, costal beading, epiphyseal enlargement, and bowing of the legs. Practically all the infants gained weight faster than the usual rate. X-ray films were made of both wrists at each examination. The feedings of the infants were checked, and the mothers were instructed that no source of vitamin D other than the irradiated evaporated milk was to be given. A special nurse visited the homes to see that all instructions were accurately carried out. Excellent cooperation was obtained throughout, and of the 113 infants selected in the fall we were able to follow no less than 103 during the whole five winter months.

In addition, we were able to observe fifty-two infants of the same age fed ordinary evaporated milk and fifty-two infants fed ordinary pasteurized milk (Table I). Incidentally during the period of these observations no irradiated evaporated milk was available commercially in Toronto. None of these infants received any vitamin D. During the last month of the period only one infant received egg yolk. Of the fifty-two infants fed ordinary evaporated milk two were premature, and of the fifty-two infants on ordinary pasteurized milk one was premature.

The irradiated evaporated milk used throughout this observation was prepared in one lot and stored until used. The milk was assayed for its vitamin D content at periodic intervals and a constant value of 9.8 international vitamin D units per ounce was found. This vitamin D content was the same as that found in ordinary commercial irradiated evaporated milk. The vitamin D assay was carried out on rats, and, in order to compensate for the calcium and phosphorus present in the milk, the vitamin D assays were made by comparing the antirachitic effect of a measured amount of the irradiated evaporated milk with 2.1 times this amount of ordinary fluid milk to which a known amount of international standard vitamin D had been added. The ordinary evaporated milk which we used was found by animal assay to give no evidence of any extra vitamin D, when compared with ordinary fluid milk.

After the final x-ray films were taken, they were examined for the presence or absence of rickets. The authors are greatly indebted to Dr. Martha Eliot, Children's Bureau, Washington, D. C., for the interpretation of all the x-ray films. The degree of rickets was classified by Dr. Eliot as 1–, 1, 2 and 3. In this paper we have called Dr. Eliot's Group 1– extremely slight rickets (a barely perceptible change which frequently might not be noted); Group 1, mild rickets (a slight

but obvious rachitic change); and Groups 2 and 3, moderate and marked rickets (well-defined fringing and cupping at the end of the bone). The interpretation of the x-ray plates was made without any knowledge of the antirachitic material administered.

Again as noted in a previous communication[2] and as confirmed by Rapoport, Stokes, and Whipple,[1] we were unable to find any constant relationship between the x-ray evidence of the presence or the absence of rickets and the clinical signs. From these observations it would appear that when dealing with a large group of patients under home conditions, it is only by x-ray examination that the presence or absence of rickets can be determined.

In Table II is given the incidence of rickets as shown by x-ray films at the initial examination in the autumn. In the interpretation of the x-ray from the clinical standpoint it must be kept in mind that the "extremely slight rickets" are so slight that most physicians would classify these x-ray plates as "normal." Those grouped as "mild rickets" also do not show changes which would cause any great concern from the clinical standpoint. In contrast to this, the "moderate" and "marked" cases with well-defined fringing and cupping at the ends of the bones are of definite concern to the practicing physician. It is to be noted that in the group fed ordinary pasteurized milk there happened to be at the initial examination a few more patients with mild rickets than in the other groups. However, these numbers, when considered with the final numbers in Table III, are not great enough to affect the conclusions drawn.

TABLE II

CASES WITH EVIDENCE OF RICKETS ON INITIAL EXAMINATION IN AUTUMN

GROUP	TOTAL NUMBER OF CASES	EXTREMELY SLIGHT RICKETS	MILD RICKETS	MODERATE AND MARKED RICKETS
Irradiated evaporated milk	103	20	1	0
Ordinary evaporated milk	52	9	1	0
Ordinary pasteurized milk	52	4	4	0

In Table III is shown the effectiveness of irradiated evaporated milk as compared with ordinary evaporated milk and ordinary pasteurized milk in the prevention of rickets. Of the 103 infants who were fed irradiated evaporated milk none developed moderate or marked rickets, while 10 per cent of those fed ordinary evaporated milk, and 23 per cent of those fed ordinary pasteurized milk developed rickets of this degree. We have no explanation of the fact that fewer infants developed moderate and marked rickets on ordinary evaporated milk than on ordinary pasteurized milk. In addition, only 17 per cent of the infants fed the irradiated evaporated milk developed mild rickets

whereas 29 per cent of those fed the ordinary evaporated milk and 25 per cent of those on the ordinary pasteurized milk showed mild degrees of rickets.

TABLE III

THE EFFECTIVENESS OF IRRADIATED EVAPORATED MILK IN THE PREVENTION OF RICKETS AS EVIDENCED BY X-RAY FILMS:

MAXIMUM DEGREE OF RICKETS OBSERVED AT ANY TIME SUBSEQUENT TO INITIAL EXAMINATION

GROUP	TOTAL NUMBER OF CASES	EXTREMELY SLIGHT RICKETS		MILD RICKETS		MODERATE AND MARKED RICKETS	
		NO.	%	NO.	%	NO.	%
Irradiated evaporated milk	103	20	19	18	17	0	0
Ordinary evaporated milk	52	8	15	15	29	5	10
Ordinary pasteurized milk	52	2	4	13	25	12	23

The x-ray films were also interpreted by Dr. Eliot on the basis of the activity of the rachitic process. For this classification the x-rays showing evidences of rickets were divided into three groups, Group A in which the rachitic process was active and showed no evidence of healing; Group B in which there was definite evidence of lime salt deposition in the rachitic process; and Group C in which the rachitic process was healed. It should be noted that this classification indicates only the state of activity of the rachitic process and does not indicate in any way the degree of rickets. In Table IV is shown the activity of the rachitic process at the times of observation. The results are rather striking. In the group receiving irradiated evaporated milk, whenever there was any evidence of rickets present, there was always evidence of healing as shown by lime salt deposition. On the other hand, in the groups receiving ordinary evaporated milk and ordinary pasteurized milk in many of the infants with "mild rickets" there was no evidence of healing.

TABLE IV

ACTIVITY OF THE RACHITIC PROCESS AT TIMES OF OBSERVATION

GROUP	TOTAL CASES	AUTUMN			MIDDLE OF WINTER			END OF WINTER		
		ACTIVE RICKETS	HEALING RICKETS	CURED RICKETS	ACTIVE RICKETS	HEALING RICKETS	CURED RICKETS	ACTIVE RICKETS	HEALING RICKETS	CURED RICKETS
Irradiated evaporated milk	103	10	11	0	0	35	1	0	22	12
Ordinary evaporated milk	52	3	7	0	9	13	0	10	10	3
Ordinary pasteurized milk	52	5	3	0	12	8	0	17	7	0

SUMMARY

1. The antirachitic effect of irradiated evaporated milk was observed on 103 rapidly growing infants, aged one to six months at the initial examination. The infants, who were largely of British descent, were observed during the five winter months. The entire milk requirements of these infants were supplied by irradiated evaporated milk, and no other source of vitamin D was administered. "Moderate" or "marked rickets" as shown by the x-ray examination did not develop in a single infant. Seventeen per cent of the infants showed x-ray evidence of "mild rickets," a degree of rickets that is not sufficient to cause any great concern from a clinical standpoint.

2. Fifty-two infants of similar ages whose entire milk requirements were covered by ordinary evaporated milk were observed over the same period. Of these, 10 per cent developed x-ray evidence of "moderate" or "marked rickets," and 29 per cent developed x-ray evidence of "mild rickets."

3. Fifty-two infants of similar ages whose entire milk requirements were furnished by ordinary pasteurized milk were also observed over the same period. Of these, 23 per cent developed x-ray evidence of "moderate" or "marked rickets," and 25 per cent developed x-ray evidence of "mild rickets."

4. In the infants receiving irradiated evaporated milk in whom x-ray evidence of "mild rickets" was found, there was always evidence of healing as shown by lime salt deposition. On the other hand, in the infants receiving ordinary evaporated milk and ordinary pasteurized milk, in many of the infants with mild rickets there was no evidence of healing.

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INCIDENCE OF COMMON CONTAGIOUS DISEASES WITHOUT QUARANTINE IN THE PEDIATRIC SERVICE OF FIFTH AVENUE HOSPITAL

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THE Health Department of New York City groups the contagious diseases in two categories. Measles, scarlet fever, and diphtheria are called "major contagious diseases," and, if any of these occur, the quarantine is obligatory throughout the total length of incubation time of the last case. Chickenpox, whooping cough, German measles, and mumps are designated as "minor contagious diseases" by the Department of Health, and quarantine for these diseases is optional.

Prior to 1931, the children's service of Fifth Avenue Hospital lost yearly one-fourth to one-half of its admission days because the service was in quarantine on account of common contagious diseases. Most of the quarantine periods, however, were due to minor contagious diseases and were optionally enforced by the hospital authorities, who thought that by rigid quarantine rules they would have a better chance to suppress the spread.

In order to find if other hospitals, for the sake of safety, likewise preferred to quarantine their wards for the minor contagious diseases, circular letters were written in 1931 to several of the leading children's services of New York City. We found that the majority of private hospitals and many of the city hospitals preferred to quarantine for the minor contagious diseases and that many of them refused admissions for several months out of the year on account of quarantine. On the other hand, about 10 per cent of the children's services of New York City installed single rooms or cubicles for the isolation of the individual patients and did not quarantine the entire department. In these services, even when quarantine rules were enforced, only the single room or cubicle was quarantined and not the entire floor.

It is interesting that even in 1935 there was a considerable number of hospitals and institutions which voluntarily adhered in the most rigid way to the rules of quarantine for practically all the common contagious diseases of childhood. Strangely enough, the quarantine of patients to be discharged is more seriously enforced than is the quarantine of the

This study was made possible by the kind cooperation of the trustees of Fifth Avenue Hospital, the superintendent, Dr. W. E. Woodbury, and by the helpful assistance of the pediatric resident, Dr. J. V. Sullivan, and the nurse in charge of our service, Miss Grace Matthews. For part of this study, Dr. Gustav Nemhauser and Dr. Oscar Rimson assisted us.

newly admitted patients. However, as Straube pointed out in the *Zeitschrift für Kinderheilkunde* in 1928, a twenty-one-day isolation and quarantine for all new admissions is more important. In the Berlin city hospital for children it was found that in 1,256 admissions 110 cases of acute contagious disease developed at the rate of 8.7 per cent. Of the 8.7 per cent, 4.8 per cent were brought in from outside and only the 3.9 per cent occurring within the hospital could be considered as true cross-infections. Straube used group isolation technic and a twenty-one-day quarantine period in the admission ward. Only whooping cough was an exception, because the twenty-one-day isolation after admission was not sufficiently long. He also claimed that the group isolation and the group quarantine were not sufficiently effective and therefore advised individual isolation of the newly admitted patients in single rooms for at least twenty-one days in order to decrease the 3.9 per cent cross-infection rate.

Those who work in general pediatric services realize that unless the hospital is built so that not the ward, but the cubicle or the single room, is the unit, individual isolation on admission is impossible. The twenty-one-day admission quarantine would mean that almost every patient would remain for practically his entire stay in the hospital in the isolation ward because in an active pediatric service only the minority of patients remain in the hospital longer than this period.

After we found that not only Fifth Avenue Hospital authorities, but those of several other hospitals, believed that quarantine is an important weapon in the prevention of cross-infections in hospital wards for children, we tried to determine whether the benefit obtained from rigid quarantining is commensurate with the inconvenience it causes. Obviously, this question could be decided only by studying the cross-infection rate in a pediatric service which enforced no quarantine and comparing the results obtained—preferably on the same service—when rigid quarantine was maintained. Strangely enough, we found very little written about the quarantine problem in general pediatric hospitals. We found more literature on the bed isolation technic in special infectious disease hospitals not employing quarantine. Although we realized that the omission of quarantine and the treatment of several contagious diseases in the same ward are attended by more risk than the simple omission of the quarantine in general hospitals for children, we thought it worth while to review the results obtained in contagious disease hospitals using the bed isolation technic without quarantine.

In 1890 Grancher in France and in 1908 Biernacki in England described the treatment of several types of contagious diseases in the same ward by using the bed isolation technic—which we now term "aseptic technic." Admissions and discharges were uninterrupted; no quarantine was applied. Biernacki treated over 300 cases with this method and had

only 1.8 per cent cross-infections. Several other contagious disease hospitals in England, Scotland, and Wales followed his example. The most outstanding of these experiments were made by Caiger, Rundle, MacIntyre, and Thomson. These four men together with Biernacki reported upon 3,377 cases of contagious diseases in common wards. Their average cross-infection rate was 1.4 per cent; in some of the hospitals the admission of chickenpox and measles cases in the common wards was avoided as much as possible because of the recognized difficulty in preventing cross-infections when children with these diseases are treated in the same wards with those suffering from other contagious diseases. The Vienna Kinderklinik was the most famous place on the Continent where bed isolation technic was used and different contagious diseases were treated in the same wards. It was organized by Escherich and later continued by Pirquet. In 1913 this department reported 7 per cent cross-infections, a figure considerably higher than the cross-infection rate in the hospitals of the English investigators; but one has to remember that in Vienna all the patients were children, whereas in the English hospitals the departments for contagious diseases accepted both adults and children. Thus the Vienna Kinderklinik had a ward population more susceptible to contagious diseases, a fact which might explain the higher cross-infection rate. Measles and chickenpox cases were admitted in Vienna, whereas in some of the English hospitals efforts were made to eliminate the admission of cases of measles and chickenpox. As these two diseases were responsible for the majority of the cross-infections in Vienna, it is easy to understand why the English authors reported a lower cross-infection rate than Pirquet.

We investigated the frequency of cross-infections in some of the contagious disease hospitals of the United States. Information was collected partly from the literature and partly by writing circular letters to a number of contagious disease hospitals. It was found that in the Providence City Hospital (for contagious diseases), when necessary, different infections were treated in the same wards with aseptic bed isolation technic; the cross-infection rate between the years of 1910 and 1930 was as low as 1.9 per cent. In the contagious disease department of the Los Angeles General Hospital between 1928 and 1933, the patients were also treated with aseptic bed isolation technic in mixed wards when necessary. Cross-infection rate was only 0.44 per cent. Neither of these two hospitals adhered to quarantine rules.

In the Willard Parker Hospital of New York City, where each contagious disease is treated in a separate ward and a partial aseptic technic is used, the cross-infection rate varied between 0.8 and 4.0 per cent between the years 1929 to 1933.

In Brooklyn in the Kingston Avenue Hospital (for contagious diseases) the ward is the unit and not the cubicle or the bed. No aseptic

technic is used; quarantine rules are rigidly followed. During the years of 1930, 1931, and 1932, 0.6 per cent of all the patients admitted acquired contagious disease through cross-infection while in the hospital.

Encouraged by the low cross-infection rate of some of these contagious disease hospitals without quarantine, we concluded that we would not take a great risk if we studied the frequency of cross-infection in a pediatric service of a general hospital without the use of either quarantine or an aseptic technic. The Health Commissioner of New York City agreed to the experiment, and the authorities of the Fifth Avenue Hospital permitted us to conduct our investigation in their children's service.

Our purpose was twofold. We wished to find out whether the quarantine system is essential in the prevention of cross-infections in the pediatric service, and we wished to try out specific convalescent serums for the prevention of the common contagious diseases of children.

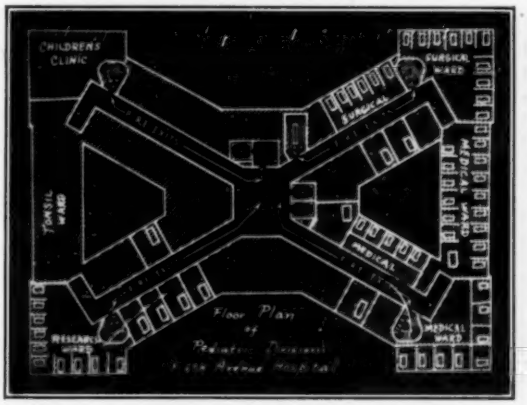

Fig. 1.

Our experiment was carried out on the entire children's service of Fifth Avenue Hospital from June 11, 1931, to July 1, 1934. During this period, 1,717 children were admitted to the children's service. The pediatric department, which occupies the whole second floor of the building, contains 63 beds (Fig. 1). Of these 63 beds, 9 are in separate rooms, 19 are in cubiculized wards, and 35 are in open wards. Even in the open wards the beds are 6½ feet apart and separated by glass partitions 8 feet high. Neither the partitions nor the cubicles reach the ceiling but stop 3¼ feet below it. The whole floor is divided into four equal units: two for the medical service, one for the surgical service, and one for the out-patient department. As the same doctors and nurses are in direct communication with all units, and the four wings of the floor are connected with corridors, for the purposes of this study we considered the whole floor, with the exception of the out-patient depart-

ment, as one unit. We excluded the out-patient department because the patients there had too short a contact with the nurses and doctors and no contact at all with the ward patients. Many of the children of the wards had quite intimate association with each other on the open terraces where those who were not too sick had the advantage of the open air.

Our scheme for the present study was as follows: When a case of contagious disease was diagnosed in the wards, the patient was reported to the Department of Health at once. An official diagnostician checked the diagnosis, and, if he agreed, the child was removed to a contagious disease hospital, or, if the parents objected, to his home. We did not quar-

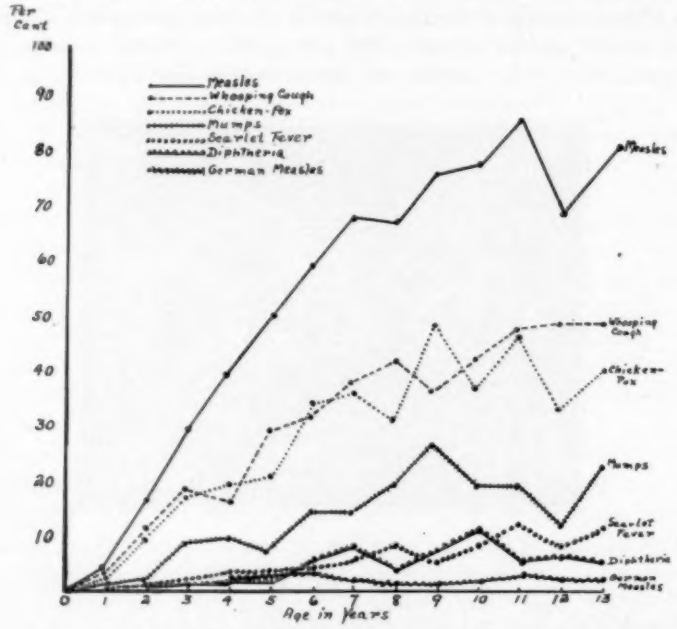

Fig. 2.—Frequency of contagious diseases in the past histories of 1,576 children admitted to the pediatric service of Fifth Avenue Hospital.

antine the hospital but kept on admitting new cases without interruption. A very careful history with regard to contagious disease was taken of every patient and Dick and Schick tests were performed.

All patients who were discharged within the incubation period of a contagious disease on the ward were checked subsequently to find whether or not they developed the disease in question at home. If they did, the case was charged against the cross-infection rate of the ward.

Where a case of contagious disease occurred on the ward, the children were grouped in three categories: (1) patients who in the past had had the particular contagious disease. In case of scarlet fever, patients with

negative Dick tests, and in diphtheria, patients with negative Schick tests were also put in this first group. Infants less than six months of age were considered as probably immune and were also placed in Group 1. Half of the group of susceptible children remaining were immunized against the specific disease by from 5 to 15 c.c. of convalescent serum given intramuscularly, and they constituted Group 2. If a case of diphtheria had occurred, diphtheria antitoxin would have been given, but there was not a single case of diphtheria during our three years' study. The remaining half was not immunized and was kept as the control, or Group 3. All three groups were closely watched for the development of the contagious disease in question.

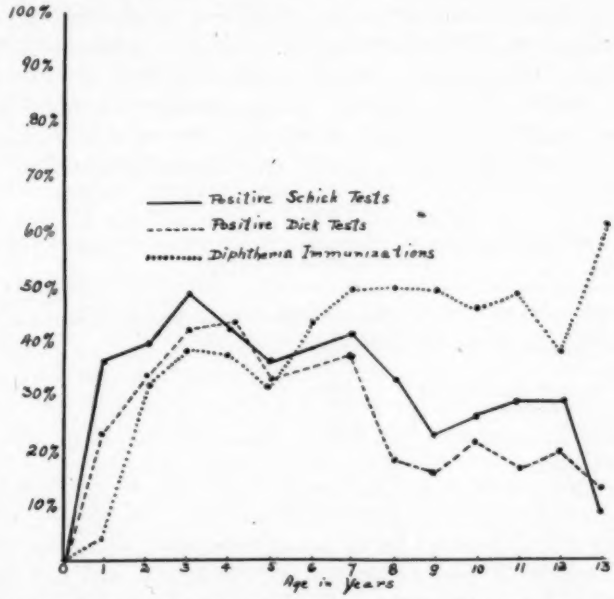

Fig. 3.—Frequency of positive Schick tests, positive Dick tests and diphtheria immunization histories among 1,576 children admitted to the children's service of Fifth Avenue Hospital.

We were very careful to select for the control and the treatment groups alternate children who were not immune. We considered the distance of exposure an important factor in our alternation. No aseptic technic was used; doctors and nurses carried out only the hygienic routine of general hospitals.

Figure 2 shows the curve of immunity of patients of different ages to the various contagious diseases as judged by a positive past history. The figures on which these curves are based were compiled from our own material collected during three years from 1,576 hospital admissions. We did not use all 1,717 admissions for obtaining these figures, as in

only 1,576 was the contagious disease history complete. From Fig. 2 we can see that the frequency of common contagious diseases is as follows: (1) measles, (2) whooping cough, (3) chickenpox, (4) mumps, (5) scarlet fever, (6) diphtheria, and (7) German measles. As a fair proportion of the hospital population was immune to measles, whooping cough, and chickenpox, and only a small proportion to mumps, scarlet fever, diphtheria, and German measles, it would have been erroneous to include these cases in the study of the value of convalescent serum or of quarantine.

Figure 3 shows not only the frequency of positive Dick and Schick reactions, but also the proportion of the children who had received diphtheria immunization in the past according to the history. It is worthy of note that 29 per cent of the children were immune to diphtheria without having been artificially immunized. This latter group of children probably became naturally immune through subclinical disease or through contact with diphtheria carriers. In the first year of life immunity transferred from the mother must also be considered.

TABLE I

CROSS-INFECTION RATE IN 1,717 ADMISSIONS TO THE CHILDREN'S SERVICE OF THE FIFTH AVENUE HOSPITAL

TYPE OF CASE	TOTAL NUMBER	NUMBER CROSS-INFECTED	PERCENTAGE CROSS-INFECTED
Susceptible, without prophylactic treatment	409	23	5.6
Susceptible, with convalescent serum immunization	393	14	3.5
All admissions	1,717	37	2.1

During the course of our three-year study only 29 children among the 1,717 admitted developed contagious diseases. Of these 29 primary cases only 6 were followed by secondary infections. The secondary infections included 30 cases of measles, 6 of chickenpox, and 1 of mumps. The total of cross-infected cases, therefore, was 37, or 2.1 per cent, of the total admissions. This cross-infection rate is between the 7 per cent cross-infection rate of the department for contagious diseases of the Vienna Kinderklinik where aseptic technic but no quarantine is used, and the low 0.6 per cent rate of the Kingston Avenue Hospital where rigid quarantine rules are observed without strict aseptic technic. The fact that the cross-infection rate of the children's service of Fifth Avenue Hospital prior to the onset of the omission of quarantine was 1.0 per cent for 1929 and 2.2 per cent for 1930 means that the omission of the quarantine system did not appreciably increase the frequency of cross-infections. We cannot explain the low figure of 2.1 per cent for cross-infections entirely by the use of convalescent serum for prophylaxis, since in the case of German measles, scarlet fever, and whooping

cough no secondary case developed either in the immunized or in the non-immunized groups; not a case of diphtheria occurred during our whole three-year study period; and more cases of chickenpox developed among the treated cases than among the controls. However, in the case of measles and mumps our figures seem to indicate that the use of convalescent serum prevented somewhat the spread of the disease. If we added up the number of all the susceptible children who were on our wards when there was a chance for them to be secondarily infected, we find that out of 802 susceptible children, only 37 cross-infections occurred, making the cross-infection rate 4.6 per cent for the susceptible patients. If we eliminate all the susceptible children who received convalescent serum, the cross-infection rate rises to 5.6 per cent. From Fig. 2 we can see clearly that it is practically impossible that the composition of a ward population should be such that all the children at one time should be susceptible to a specific disease. During our three-year study, of 1,717 admissions only 802, or 47 per cent, were susceptible to the different contagious diseases to which they happened to be exposed. If the 37 cases of contagious diseases had involved the closing up of our wards for the usual length of time for quarantine, the hospital would have been closed for 452 days, out of the total of 1,124 admission days, or 40 per cent of the total time.

Table II gives the detailed consequences of the different primary contagious disease cases which occurred during our study in the children's service of Fifth Avenue Hospital.

After the analysis of the case histories of the patients who became cross-infected while in the hospital, we came to the conclusion that very few of them would have escaped infection even if we adhered to the quarantine system since most of them were on the wards at the time when the first case occurred. Therefore, it is obvious that we could have gained but little by carrying out the customary quarantine rules. On the other hand, by omitting the quarantine system we gained the following:

1. The hospital was of service to the sick children seeking admission for 452 more days in the course of three years than it would have been if the quarantine system had been maintained.

2. The internes and nurses had the opportunity to see nearly twice the number of cases that they could have if admissions had been avoided during 40 per cent of the time.

3. Each month of quarantine means a loss of from $400 to $500 to the hospital because of the necessity of maintaining the same staff of doctors, nurses, and attendants without being able to accommodate private patients. This loss in the course of 452 days of quarantine would have amounted to from $6,000 to $7,000.

TABLE II

CONTAGIOUS DISEASES OCCURRING IN THE PEDIATRIC SERVICE OF FIFTH AVENUE HOSPITAL FROM JUNE 11, 1931, TO JULY 1, 1934

NO.	DATE	DISEASE	IMMUNIZED CASES		CONTROL CASES		LENGTH OF EXPOSURE
			TOTAL NO.	CROSS-INFECTED	TOTAL NO.	CROSS-INFECTED	
1	6/26/31	Rubella	3	–	4	–	1½ days
2	2/15/32	Rubella	19	–	22	–	2 days
	Total	Rubella	22	–	26	–	
3	12/31/31	Scarlatina	5	–	3	–	1½ days
4	3/23/32	Scarlatina	16	–	10	–	2 days
5	4/25/32	Scarlatina	6	–	7	–	2 days
6	7/13/32	Scarlatina	2	–	9	–	6 hr.
7	5/16/34	Scarlatina	9	–	8	–	2 hr. 1 day
	Total	Scarlatina	38	–	37	–	
8	6/19/31	Pertussis	3	–	3	–	2 hr. 8 days
9	7/ 2/31	Pertussis	3	–	3	–	1½ days
10	9/ 1/31	Pertussis	9	–	3	–	1-21 days
11	10/ 8/31	Pertussis	4	–	4	–	1 day
12	10/30/31	Pertussis	13	–	4	–	2 days
13	8/11/33	Pertussis	19	–	14	–	26 hr.
14	9/ 2/33	Pertussis	12	–	12	–	2-7 days
15	10/23/33	Pertussis	12	–	14	–	6 hr. 7 days
16	11/ 6/33	Pertussis	11	–	16	–	1-8 days
17	12/12/33	Pertussis	10	–	17	–	4 hr. 16 days
	Total	Pertussis	96	–	90	–	
18	5/30/32	Parotitis	6	–	6	–	9 days
19	6/ 8/32	Parotitis	16	–	20	–	3 days
20	4/14/33	Parotitis	26	–	31	–	29 hr.
21	4/20/34	Parotitis	17	–	36	1 2.8%	4 hr.-4 days
	Total	Parotitis	65	–	93	1 1.7%	
22	5/17/32	Varicella	14	–	18	–	6-8 hr.
23	3/ 4/33	Varicella	33	5 15.0%	62	1 1.5%	12 hr.-38 hr.
	Total	Varicella	47	5 10.6%	80	1 1.2%	
24	7/17/31	Morbilli	4	–	4	–	1 day
25	3/24/32	Morbilli	34	2 5.0%	44	15 34.0%	20 hr.-2 days
26	1/18/33	Morbilli	16	–	26	3 11.0%	6 hr.-6½ days
27	2/13/33	Morbilli	23	5 22.0%	6	2 33.0%	6 hr.-11½ days
28	3/25/33	Morbilli	22	1 4.0%	2	1 50.0%	1-16½ days
29	5/ 6/33	Morbilli	26	1 4.0%	1	–	1-20 days
	Total	Morbilli	125	9 7.0%	83	21 25.0%	
	All cases		393	14 3.5%	409	23 5.6%	
		Total	802 cross-infected 37, or 4.6%				

CONCLUSIONS

1. For the past three years in the children's service of Fifth Avenue Hospital quarantine was not observed.

2. In the place of quarantine and the aseptic technic, specific convalescent serum was used for prophylaxis against all common contagious diseases in half of the susceptible groups. One-half of the susceptible children were used as controls.

3. No secondary cases of German measles, whooping cough, or scarlet fever occurred.

4. The chickenpox convalescent serum appeared to be of no value.

5. Serum from convalescent patients with mumps apparently decreased the morbidity of parotitis from 2.8 per cent to 0; measles convalescent serum apparently decreased the incidence of cross-infection of measles from 25 per cent to 7 per cent.

6. The order of frequency of cross-infections was measles, chickenpox, and mumps.

7. Of 1,717 hospital admissions 37, or 2.1 per cent, became infected while in the hospital.

8. Only 47 per cent of the ward population were susceptible to the contagious disease to which they were exposed.

9. The cross-infection rate of the susceptibles was 4.6 per cent.

10. The lack of quarantine and the lack of aseptic technic did not appreciably increase the cross-infection rate of our pediatric service.

11. The disadvantages of quarantine for a general pediatric service are much greater than the good achieved by its use.

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1225 Park Avenue

GROWTH OF THIRTY-TWO EXTERNAL DIMENSIONS DURING THE FIRST YEAR OF LIFE

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DATA in the literature on the external dimensions during the first year of life are meager.[1-3] In this paper means and standard deviations* for thirty-two external dimensions are recorded by certain subdivisions of age under one year (Table I, A and B). Similar data for the dimensions of the thoraco-abdominal cavity, the cardiac silhouette, the mediastinum, the radius and ulna are recorded elsewhere.[4, 5]

Means for dimensions at age intervals not given in the table may be readily obtained by constructing curves from the mean values and interpolating.

The infants used in this study were born in the Fifth Avenue Hospital and were supervised from birth in a special clinic. They came from homes of moderate income. The number of infants classified by sex and racial origin and the number of times they were measured is shown in Table II. The instruments used and the dimensions measured have been described elsewhere.[7]

THE BODY PROPORTIONS

Since the external dimensions of the body grow at different rates during the first year of life, there results a change in the body proportions. In relation to total body length all external dimensions in Table I become smaller during the first year of life with the following exceptions: The biacromial diameter of the trunk, the length of span, and the foot dimensions remain relatively unchanged. The bicristal diameter of the trunk and the length of the humerus, femur, and tibia become relatively larger. Weight also increases more rapidly than total body length. The most striking change in the body proportions is in the relative size of the head, the head circumference—total body length index falling from 68.3 at birth to 60.8 at one year.

A number of changes occur in facial configuration. The face at birth is broad, particularly in its lower portion; the nose is broad and short

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*The standard deviation is a measure of the dispersion of values around the mean. One standard deviation on each side of the mean includes 67 per cent of the cases, and two standard deviations 95 per cent of the cases. In older anthropometric studies the percentile method has been used for expressing variability. More recently, however, it has been replaced by the standard deviation. Though more laborious to calculate, the standard deviation has a number of advantages over the percentile method[6]. It is, in general, less affected by fluctuations in sampling. Because of its algebraic properties it is more useful in connection with other statistical formulas. In this regard it is invaluable in calculating the reliability of differences between disease and normal groups. It is also more useful in cases of discontinuous variation. Furthermore, the percentile is not infrequently indeterminate.

TABLE I A

THE EXTERNAL DIMENSIONS OF MALES BY CERTAIN SUBDIVISIONS OF AGE UNDER ONE YEAR (IN MILLIMETERS)

	AGE IN WEEKS															
	0-3		4-7		8-15		16-23		24-31		32-39		40-47		48-55	
	MEAN	ST. D.*	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.
Total body length	518.50	22.27	552.56	23.60	600.83	27.21	651.07	21.73	685.11	22.53	717.73	25.77	745.89	27.62	765.68	22.70
Length of span	514.90	24.10	547.56	26.60	591.64	25.30	635.52	24.80	675.17	28.60	706.63	31.20	736.54	34.90	758.14	30.00
Body weight (gm.)	3515.10	570.00	4585.40	658.00	5750.00	720.00	7090.00	750.00	8207.20	1000.00	9291.00	1052.00	10,060.00	1184.00	10,800.00	1210.00
Sitting height	350.53	15.40	370.60	19.10	399.10	20.00	431.23	20.00	450.21	19.10	469.30	23.30	479.05	19.70	490.06	21.50
Circumference of head	353.52	14.65	377.46	13.20	399.30	13.35	417.87	12.00	436.12	11.90	448.01	13.95	458.89	12.05	464.88	13.10
Cephalic length	120.70	5.36	128.40	6.14	132.60	7.28	137.90	5.68	143.90	4.90	147.20	6.02	151.97	5.24	155.30	7.20
Cephalic breadth	95.00	4.70	102.12	4.60	109.28	6.20	117.24	4.62	119.37	7.14	123.48	6.18	125.79	5.38	129.08	5.32
Diameter of face (bimalar)	72.42	4.44	77.59	4.54	85.38	4.68	90.33	4.56	92.93	4.89	95.32	5.29	95.10	4.66	96.77	5.33
Diameter of face (bigonial)	58.08	3.62	62.88	3.63	67.28	4.00	70.47	3.57	72.84	3.76	73.94	3.96	74.97	4.00	75.44	3.75
Upper facial length (nasion-prosthion)	33.25	2.15	36.21	2.12	38.34	2.42	40.33	2.16	41.85	2.31	42.52	2.52	43.13	2.31	43.65	2.71
Height of lower jaw	17.50	1.57	19.45	1.62	20.77	1.53	21.94	1.65	22.90	1.92	23.81	1.74	24.42	2.20	25.56	2.38
Height of nose	22.83	1.83	24.81	1.78	26.44	2.26	28.00	1.64	29.09	2.40	29.59	1.82	30.36	1.92	30.91	1.90
Breadth of nose	22.10	1.75	23.58	1.67	24.47	1.67	25.43	1.62	25.89	1.65	26.32	1.66	26.95	1.54	27.27	1.31
Inter-inner canthus diameter	21.80	1.57	23.14	1.48	24.02	1.66	25.09	1.59	25.77	1.82	26.20	1.79	26.42	1.81	26.61	1.64
Length of palpebral fissure	21.26	1.91	22.31	1.67	23.56	1.47	24.88	1.53	25.70	1.71	26.53	1.72	27.00	1.59	27.63	1.68

*St. D. means standard deviation.

TABLE I A—CONT'D

	AGE IN WEEKS															
	0-3		4-7		8-15		16-23		24-31		32-39		40-47		48-55	
	MEAN	ST. D.*	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.
Length of ear	37.09	3.00	40.37	2.72	43.22	2.66	45.01	2.70	47.08	2.51	47.80	3.04	48.22	2.92	48.45	3.39
Breadth of ear	25.08	1.77	26.74	1.95	27.47	2.28	29.09	2.33	29.84	1.98	30.81	2.46	30.91	2.28	31.38	2.11
Circumference of thorax at the nipples	323.84	19.17	350.59	19.96	380.93	19.86	405.56	17.54	423.16	18.42	441.44	21.53	452.06	24.10	467.59	16.51
Biacromial diameter	119.57	8.47	130.30	9.09	141.10	9.18	151.90	8.96	161.00	9.41	169.10	9.40	175.30	9.45	179.80	7.05
Bicristal diameter	79.68	6.65	90.48	6.16	98.52	7.58	106.99	6.46	112.04	5.57	117.54	6.31	119.50	7.04	121.04	7.60
Length of humerus	85.38	5.90	92.44	5.74	102.14	6.72	110.70	6.22	117.82	6.79	124.23	7.39	129.26	7.68	134.32	6.98
Length of radius	72.56	4.14	75.60	4.44	80.90	4.72	86.66	4.60	91.09	4.65	95.78	6.26	99.74	5.67	103.88	5.13
Length of hand	66.22	3.52	69.34	3.36	73.92	3.88	76.56	3.58	82.21	3.61	86.47	3.85	88.75	3.97	92.20	4.06
Length of palm	37.60	2.31	39.92	2.34	42.55	2.23	45.27	2.01	47.45	2.01	49.43	3.60	51.04	2.34	53.24	2.48
Breadth of palm	32.50	2.28	35.20	1.82	37.00	2.05	38.51	2.08	40.73	2.39	42.33	2.92	43.24	2.49	44.73	2.39
Length of middle finger	34.25	2.03	35.60	1.90	37.57	2.22	39.86	1.79	42.15	1.94	43.73	2.48	45.25	2.21	46.47	2.35
Length of thigh	121.52	8.14	130.36	7.78	143.70	9.66	154.90	9.36	167.42	10.87	177.86	11.05	183.94	10.62	192.37	12.25
Length of tibia	87.60	6.40	91.24	5.50	99.90	6.72	107.58	6.90	113.36	6.72	122.15	8.99	127.08	7.69	132.86	7.96
Length of lower extremity	232.10	12.75	248.60	12.25	273.10	15.10	295.15	14.70	314.64	16.03	335.73	17.74	346.81	16.67	363.00	18.96
Height of foot	21.98	3.42	26.00	2.54	28.50	3.10	31.67	3.08	32.86	2.98	34.72	3.66	34.79	4.34	36.77	3.72
Length of foot	79.57	4.12	83.60	4.18	89.38	5.02	95.66	4.78	101.23	4.84	105.91	5.78	110.61	6.02	116.10	5.18
Breadth of foot	31.04	2.21	34.75	2.17	37.02	2.29	39.72	2.17	41.38	2.56	43.41	2.84	44.28	2.71	46.40	2.75

TABLE I B

THE EXTERNAL DIMENSIONS OF FEMALES BY CERTAIN SUBDIVISIONS OF AGE UNDER ONE YEAR (IN MILLIMETERS)

	AGE IN WEEKS															
	0-3		4-7		8-15		16-23		24-31		32-39		40-47		48-55	
	MEAN	ST. D.*	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.
Total body length	510.03	19.51	544.98	20.95	589.00	23.08	632.41	23.66	674.38	19.97	697.68	19.26	733.38	25.26	747.67	22.11
Length of span	505.14	22.40	532.08	25.60	572.25	24.00	618.31	24.00	657.37	22.20	691.47	22.10	711.28	27.30	740.17	26.20
Body weight (gm.)	3380.40	424.00	4246.00	570.00	5310.00	720.00	6440.00	760.00	7670.00	800.00	8460.00	824.00	9200.00	1068.00	9900.00	1044.00
Sitting height	345.44	13.80	363.74	17.60	389.42	17.80	415.57	20.90	436.97	14.80	452.08	16.30	465.69	24.00	477.33	18.00
Circumference of head	347.83	13.90	369.54	13.75	389.16	13.20	409.12	12.20	423.96	11.95	437.76	10.90	445.48	12.70	454.58	11.05
Cephalic length	117.81	4.45	124.83	6.09	129.37	5.91	134.94	5.57	139.10	5.81	143.80	5.44	147.42	5.67	150.91	5.23
Cephalic breadth	93.92	4.72	100.29	4.78	107.18	5.18	113.58	4.54	118.64	4.22	122.71	4.72	124.91	4.91	126.60	4.58
Diameter of face (bimalar)	71.52	4.04	76.41	4.56	82.86	4.68	87.30	5.10	90.40	4.79	93.30	4.32	93.30	5.67	94.50	4.81
Diameter of face (bigonial)	57.38	4.06	60.60	3.78	65.75	3.56	68.16	4.04	70.27	3.46	71.10	3.56	72.64	3.66	73.47	3.06
Upper facial length (nasion-prosthion)	32.08	1.97	34.25	1.99	36.68	2.33	38.20	2.10	39.58	1.93	40.93	2.22	41.54	2.42	41.98	2.15
Height of lower jaw	17.36	1.32	18.89	1.52	20.08	1.44	21.06	1.47	21.82	1.26	22.92	1.93	23.02	1.87	23.73	2.04
Height of nose	22.01	1.80	23.18	1.73	25.00	2.06	26.36	1.97	27.40	1.79	28.36	2.13	28.92	1.77	30.27	2.50
Breadth of nose	21.87	1.93	22.52	1.47	23.46	1.71	24.26	1.66	24.90	1.54	25.59	1.44	26.17	1.87	26.77	1.79
Inter-inner canthus diameter	21.42	1.83	22.34	1.71	23.38	1.79	24.24	1.54	24.76	1.55	25.32	1.68	26.00	2.18	26.07	1.45
Length of palpebral fissure	20.96	1.91	21.99	1.72	23.26	1.84	24.07	1.63	25.02	1.68	26.09	1.28	26.39	1.77	27.00	1.47

TABLE I B—CONT'D

	AGE IN WEEKS															
	0-3		4-7		8-15		16-23		24-31		32-39		40-47		48-55	
	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.	MEAN	ST. D.
Length of ear	36.19	2.73	38.66	2.64	41.19	2.74	43.56	2.67	45.15	2.84	46.64	2.83	46.46	2.80	47.67	2.64
Breadth of ear	24.49	1.82	25.17	2.10	26.54	2.03	27.70	2.03	28.69	2.20	29.33	1.83	30.14	2.47	30.53	1.64
Circumference of thorax at the nipples	318.65	19.10	342.44	17.45	368.09	19.85	390.05	17.65	407.13	19.55	428.38	18.55	437.48	21.30	447.98	19.20
Biacromial diameter	116.50	8.28	125.72	7.50	136.06	8.90	145.80	9.16	157.95	8.60	164.72	9.12	168.65	9.02	173.29	8.26
Bicristal diameter	77.12	5.36	84.45	6.44	94.26	5.94	101.63	6.00	108.29	6.12	111.60	6.88	114.83	6.40	117.89	6.50
Length of humerus	84.60	5.64	89.89	5.64	98.20	6.00	107.43	6.08	114.84	5.10	121.02	5.90	124.53	6.22	130.05	6.20
Length of radius	70.94	3.94	73.17	4.38	78.28	4.28	83.56	4.36	88.84	3.92	93.44	3.84	96.36	5.06	99.62	4.94
Length of hand	64.63	3.22	67.21	3.54	71.15	3.30	75.35	3.26	79.55	3.68	82.94	3.01	85.41	3.83	88.51	4.03
Length of palm	36.62	2.11	38.68	1.92	40.75	2.11	43.16	2.46	45.60	2.05	48.02	2.28	49.65	2.30	51.34	2.46
Breadth of palm	31.57	1.89	33.47	2.12	34.86	1.85	36.73	1.72	38.59	1.85	39.82	1.89	41.10	1.92	42.81	2.06
Length of middle finger	33.79	1.94	34.61	2.16	36.03	1.91	37.97	2.22	40.32	2.01	42.02	2.01	43.14	2.39	44.80	2.47
Length of thigh	121.09	8.36	130.08	10.44	142.23	9.44	155.24	9.76	167.56	9.12	175.53	9.80	181.01	9.70	187.96	10.48
Length of tibia	86.29	6.10	90.77	6.84	97.98	7.20	105.44	7.44	113.30	6.58	118.47	7.50	124.26	7.60	129.83	8.16
Length of lower extremity	230.14	11.95	246.85	13.50	268.05	14.05	291.23	14.15	313.28	13.45	327.91	15.80	340.31	14.90	353.61	15.15
Height of foot	21.76	3.00	25.00	3.38	26.84	4.18	29.55	3.14	31.42	2.32	32.91	4.48	34.04	3.56	34.82	3.92
Length of foot	78.08	3.78	80.96	4.06	86.58	4.32	91.99	4.24	97.39	3.98	102.86	4.80	106.53	5.56	111.60	4.80
Breadth of foot	29.88	2.23	32.99	2.24	34.88	2.19	37.33	2.33	39.63	2.25	41.66	2.53	42.88	2.50	43.97	2.23

and the bridge depressed. The palpebral length and particularly the inter-inner canthus diameters are large. At one year the face is relatively narrower, the nose longer and narrower and the eyes smaller and closer together.

The lower extremities grow more rapidly in length than the remainder of the body. This is true also of the bicristal diameter and confirms the observation that the lower portion of the body grows more rapidly than the upper portion during this age period.

SEX

At birth the male infant is larger in the external dimensions than is the female infant, indicating a more rapid growth during prenatal life. The female infant, on the other hand, is more advanced physiologically as indicated by the earlier ossification of the epiphyseal centers.[8] Other differences during prenatal life are the larger number of male conceptions, estimated at about 108 males to 100 females,[9] and the higher death rate among male infants. The higher mortality among males continues after birth and is found for every disease during infancy except pertussis and erysipelas. It is, therefore, of interest to determine whether any differences in growth exist during this age period.

Although boys are larger than girls at all age subdivisions no differences in body proportions were noted for the external dimensions measured. There was also no significant difference in the variability of the various dimensions.

TABLE II

DISTRIBUTION OF INFANTS MEASURED BY SEX AND NATIONALITY

NATIONALITY	NUMBER OF INFANTS			NUMBER OF TIMES MEASURED		
	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES
All nationalities	198	94	104	1328	598	730
Mediterranean	38	16	22	233	84	149
North European	65	32	33	476	220	256
Central European	21	12	9	151	79	72
Jewish	44	22	22	327	162	165
U. S. A.	14	6	8	88	34	54
Undetermined	16	6	10	53	19	34

NATIONALITY

No consistent differences were found in the head dimensions or indices of infants from the national groups designated in Table II. There was also no difference in the bimalar diameter of the face. Other dimensions were not calculated since head shape is ordinarily considered one of the most striking of national characteristics.

SUMMARY

1. Means and standard deviations for thirty-two external dimensions are recorded by certain subdivisions of age under one year.

2. Differences in body proportions at birth and at one year are described.

3. Neither sex nor nationality has any influence on body configuration during the first year of life.

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THE COMPARATIVE VALUE OF THE SCHILLING DIFFERENTIAL BLOOD COUNT AND THE SEDIMENTATION OF THE ERYTHROCYTES IN ACUTE RHEUMATIC FEVER IN CHILDHOOD

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IN THE treatment of acute rheumatic fever it is of importance to know when the acute process has completely subsided and when to allow the patient out of bed. This is especially significant in those with first attacks in order to prevent, if possible, the development of serious cardiac lesions. The caution of various clinicians is well summarized by Lewis, "Convalescence should proceed slowly and be well consolidated. In cases of carditis the end of active infection is most difficult to gauge and months must pass before recovery can be regarded as complete."[1]

Since the mere disappearance of symptoms can be no indication of recovery,[2, 3] various guides have been sought—subsidence of fever for an indefinite period of weeks, normal pulse rate, and total white cell count being the usual criteria. These, however, have been found normal in the presence of low grade infection and are therefore unreliable. Numerous observers have reported the value of the sedimentation of the red cells in indicating quiescence[4-8] and have emphasized the importance of keeping convalescent rheumatic fever patients at rest until this test is normal, the one important point in therapy.

Another blood examination, the Schilling differential count, wherein the presence of immature white cells is noted, has been much used as an index of active infection in various acute illnesses, and its value has been repeatedly established.[9] It was deemed useful, therefore, to compare the Schilling smear and the sedimentation of the red cells in cases of acute rheumatic fever, especially since these tests have not given corresponding results in other conditions, the sedimentation test appearing less sensitive than the Schilling count.[10] In acute appendicitis, for example, it is interesting to note that the sedimentation rate is often normal in the presence of a marked left shift in the Schilling smear.

For this reason we applied these tests in a series of acute rheumatic fever cases. It was first planned to study primary cases without evident cardiac involvement, but such cases were too few, and it became necessary to include those with acute and chronic carditis. Even with these it was possible to collect but twenty-five suitable cases in three years. On this material our study is based.

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METHOD

For the sedimentation tests venous blood was withdrawn and mixed with 2 per cent sodium citrate solution in the proportion of one part of citrate to five parts of blood. This mixture was placed in tubes and allowed to stand at room temperature. Readings were made at appropriate intervals. Schilling smears, total white counts, red cell and hemoglobin determinations were also done on admission. The Schilling counts and the sedimentation tests were made at weekly or ten-day intervals until normal. Our patients were under observation from three to sixteen weeks.

There are many methods in use for determining the sedimentation of the red cells, each depending on some slight variation in bore or length of the tube used with altered markings. The principle involved is the same and these slight modifications only cause confusion and require a new set of normal values for each new tube. There is, however, one main difference in systems used. One system measures the sedimentation time; the other measures the sedimentation rate. We used the Linzenmeier and the Westergren methods as an example of each of these systems. In our later work we preferred the Cutler method in place of the Westergren and finally used it exclusively.

Sedimentation time is measured by the Linzenmeier method, in which a short tube 70 mm. long with a 5 mm. bore is used and graduated at 6, 12, 18, and 24 mm. The time necessary for the column of cells to fall to the 18 mm. mark is recorded —normally two or more hours. The disadvantage of the method is the necessity for constant watching of the tube.

Sedimentation rate is measured by the Westergren and Cutler methods. The Westergren tubes are 300 mm. long and graduated from 0 to 200 mm. in 1 mm. intervals. The distance the cells drop in one-half and one hour is noted—normally 10 mm. or less at the end of one hour.

The Cutler tube is also a short tube 70 mm. long with an internal bore of 5 mm. and is marked from 0 to 40 mm. The distance the column of cells falls in one-half hour is read and should be 10 mm. or less, normally. Some take a second reading after one hour, but there is very little additional drop.

TABLE I

READINGS ON CONTROL CASES WITHOUT INFECTION, TO ESTABLISH NORMAL FIGURES FOR VARIOUS TESTS USED

NORMAL CONTROL CASES	AGE IN YR.	SCHILLING PER CENT IMMATURES	SEDIMENTATION TESTS			R.B.C.	HG. % SAHLI	HG. GM.
			LINZENMEIER	WESTERGREN	CUTLER			
1	12	10	3.3 hr.	13.0 mm.		4,860,000	70	
2	12	8	12.0 hr.	2.5 mm.		4,770,000	75	
3	11	5	5.0 hr.	10.0 mm.		4,690,000	70	
4	10	10	6.0 hr.	4.5 mm.		4,890,000	76	
5	8	10	4.0 hr.	6.0 mm.		4,370,000	66	
6	11	3	6.0 hr.	5.0 mm.		4,610,000	90	
7	11	9	5.0 hr.	5.0 mm.		4,790,000	85	
8	7	8	4.0 hr.	5.0 mm.		4,500,000	88	
9	10	5	3.5 hr.	7.0 mm.		5,200,000	92	
10	7	7	3.0 hr.	8.0 mm.		5,080,000	—	
11	7	9			7 mm.	3,800,000	72	10.5
12	8	9			4 mm.	5,040,000	83	12.1
13	10	7			5 mm.	5,190,000	96	14.0
14	11	9			3 mm.	4,820,000	83	12.1
15	12	9			6 mm.	5,100,000	88	12.8
16	7	7			4 mm.	3,180,000	76	11.0
17	8	3			10 mm.	4,820,000	80	11.5
18	8	6			5 mm.	4,170,000	72	10.4
19	6	8			10 mm.	4,280,000	78	11.4
20	7	4			7 mm.	4,610,000	80	11.6

In our control series all three methods for determining the sedimentation of the red cells gave accepted normal values, but in the sick patients the Cutler and Linzenmeier readings often reached normal while the Westergren was still rapid.

Various factors, such as anemia, cell volume, room temperature, etc., have been shown to cause appreciable errors in the reading of the sedimentation test.[11] Kahlmeter,[12] Walter,[13] and others have used a corrected sedimentation rate index. Rourke and Ernstene[14] have found the normal limits of the corrected index to be from 0.08 to 0.35 mm. per minute, which could produce a marked distortion in delayed readings. However, the degree of anemia was not sufficiently marked in our cases to cause serious errors, and corrected readings were deemed unnecessary for all practical purposes.

Since Fahraeus published his first observations on the sedimentation rate in 1918, there has appeared a vast literature on the factors controlling this phenomenon, and we need not review these theoretical studies here. They are well summarized by Walton.[15]

ANALYSIS OF CASES

In our work it soon became apparent that the Schilling blood count and the sedimentation tests both reacted to the rheumatic infection in its early stages. There were usually an abnormal number of polymorphonuclear leucocytes of the immature form in the blood stream from one to several weeks after the temperature and pulse became normal. At times the blood smear appeared normal simultaneously with the fall in temperature or even anticipated this improvement, an observation which corroborated earlier work done in acute infections with the Schilling smear.[9]

With occasional exacerbations and reappearance of joint swellings, or with the onset of a pericarditis, an increase in the immature white cells and increased sedimentation time and rate invariably appeared (Case 7). With each subsidence of signs and symptoms, however, the sedimentation tests always lagged in their return to normal and remained rapid for weeks after the disappearance of immature cells from the blood. Thus the sedimentation tests must be considered more sensitive to the presence of active rheumatism than the Schilling smear (Table II).

This is perhaps best explained by the growing belief that some factor may play a rôle in rheumatism, which is slow in subsiding after the acute infection has actually ended. To this there would be no response of the hematopoietic organs and hence not reflected in the Schilling smear. In many cases of rheumatism an eosinophilia occurs[16, 17] during some stage of the illness. One of our patients showed an eosinophilia of 10 per cent, another of 15 per cent. This suggests the presence of an allergic factor, but the sedimentation rate is generally delayed in allergic conditions. In any event there is a factor at work during convalescence

from acute rheumatic infections, which could conceivably cause a physicochemical change in the blood affecting the sedimentation rate and time.

TABLE II

Illustrative cases showing how temperature and pulse first reach normal, to be followed shortly by the Schilling count and finally by the sedimentation rates. Abbreviations: TPN (temperature and pulse normal), N (normal). Normal values: Linzenmeier—120 minutes or more; Westergren—10 mm. in one hour; Schilling—about 10 per cent or less; Cutler—10 mm. or less.

Date	Aug., 1932 2	8	15	22				
Case 6	T103		TPN	N				
Linzenmeier in minutes	50	40	70	120				
Westergren mm. in 1 hr.	56	60	49	25				
Schilling per cent immatures	23	N 7	9	11				
Date	Mar., 1932 24	Apr. 1	8	18	28	May 10	June 9	30
Case 7	T101		TPN					
Linzenmeier in minutes	15	15	50	45	50	12	45	82
Westergren mm. in 1 hr.	90	100	40	74	60	70	87	20
Schilling per cent immatures	16	N 9	27	24	20	24	12	—
Date	Apr., 1933 15	21	29	May 5	13	20	26	
Case 10	T102		TPN					
Linzenmeier in minutes	9	17	30	45	30	100	105	
Westergren mm. in 1 hr.	147	106	72	45	15	19	12 N	
Schilling per cent immatures	47	15	14	N 11	9	10	5	
Date	Mar., 1933 30	Apr. 2	10	16	24	May 1		
Case 8	T101		TPN			N		
Linzenmeier in minutes	25	20	45	77	90	130 N		
Westergren mm. in 1 hr.	—	85	48	28	20	10		
Schilling per cent immatures	22	—	14	N 11	2	1		
Date	Jan., 1935 19	28	Feb. 6	20	Mar. 8			
Case 16	T104	TPN			N			
Cutler mm. in ½ hour	31	29	24	19	5			
Schilling per cent immatures	30	N 11	7	—	—			

In order to obtain normal values for the laboratory tests we were to perform on our patients, we examined a series of twenty normal children, i.e., without acute infection as evidenced by a normal Schilling count with immature "stab" cells below 10 per cent. Red cell and hemoglobin determinations and sedimentation tests were done on these children. The Westergren and Linzenmeier methods were used in the first ten cases, the Cutler method in the last. The highest normal value for the Schilling count was 10 per cent. In the Linzenmeier tubes it

took from three to twelve hours for the column of cells to fall 18 mm. In the Westergren tubes the column fell from 2.5 to 13 mm. in one hour. The high figure in one case was accepted as normal in view of a normal blood smear, a normal Linzenmeier test, and a negative history (Case 1). The normal figures for the Cutler tube ranged from 3 to 10 mm. in one-half hour.

The following illustrative cases are described in some detail for the various points of interest they offer:

CASE 6.—J. B., male, aged ten years, was admitted Aug. 2, 1932, with painful swellings in the ankles, knees, and hips, and fever for fourteen days. There was no previous history of a similar nature. The positive physical findings were exquisitely tender and swollen ankles, and a short, soft, blowing, systolic murmur heard at the apex of the heart. The temperature was 103° F.

Both sedimentation tests were very rapid and the Schilling smear showed numerous immature cells. One week later all symptoms had disappeared, and the

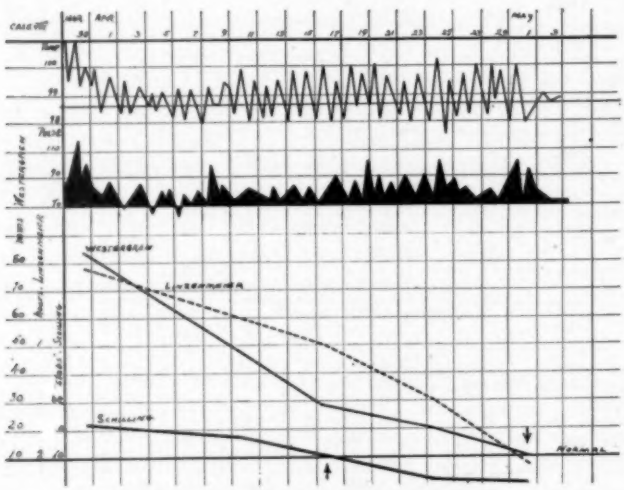

Chart 1.—Case 8. Note how the Schilling curve reaches normal two weeks before the sedimentation tests (arrows indicate normal).

temperature and pulse were normal. The smear was normal, but the sedimentation tests were still unchanged. They began to improve during the following week; the Linzenmeier reading became normal two weeks after the Schilling had become normal, and the Westergren reading was much improved but lagging (Table II).

CASE 7.—M. G., male, aged eleven years, was admitted March 24, 1933, with pain and swelling in the shoulders and knees three days after the onset of a sore throat, the duration of the joint symptoms being one week. The temperature on admission was 101° F. There were swelling and redness of the knees. The heart was negative. The red cells were 3,700,000; the hemoglobin content was 78 per cent (Sahli) and the leucocytes, 6,500.

Both sedimentation tests were very rapid, the smear showing but a moderate left shift (16 per cent immature cells). All tests indicated the presence of active infection, however. The sedimentation tests continued very rapid though the smear

became normal one week after admission. During the second week in the hospital, however, immature cells reappeared in the blood, followed by an acute exacerbation of all symptoms with joint involvement and a temperature to 103° F. The heart remained negative. Both sedimentation tests were markedly increased, the column in the Linzenmeier tube falling 18 mm. in twelve minutes. One month after subsidence of this second attack, the immature cells had practically reached normal, while the sedimentation tests, though improved, remained high, only approaching normal three weeks later (Table II).

CASE 8.—C. H., male, aged twelve years, admitted March 30, 1933, had a painful, tender swelling of the left ankle for three days. There was no previous history of rheumatism. There was a soft, blowing systolic murmur at the apex of the heart.

The laboratory findings were: R.B.C., 4,900,000; hemoglobin, 84 per cent (Sahli); and W.B.C., 18,400. The Linzenmeier tube showed a drop of 18 mm. in

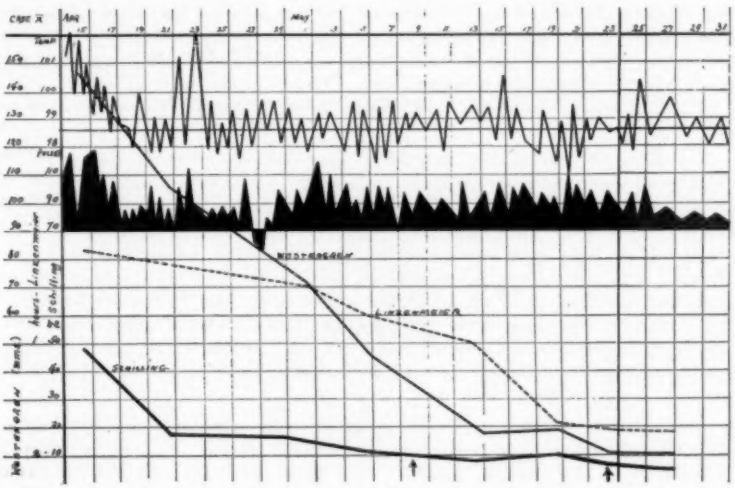

Chart 2.—Case 10. Note the extremely rapid Westergren and the prolonged Linzenmeier tests, which reach normal two weeks after the Schilling count (arrows indicate normal).

twenty-five minutes. There were 22 per cent immature cells in the blood. Ten days later all tests showed improvement with normal temperature and pulse, but activity was still indicated. Seventeen days after admission the smear was normal and the sedimentation tests improved. Both Linzenmeier and Westergren tests became normal two weeks after the blood smear, showing once again the greater sensitivity of the sedimentation tests. The child was not allowed up until all readings were normal (Table II) (Chart 1).

CASE 10.—C. F., female, aged nine years, was admitted April 15, 1933, complaining of pains in all joints with swelling and fever of three days' duration. Examination showed acutely inflamed joints of the left elbow and the large toes, with redness, swelling, and tenderness. There was an apical systolic murmur. The temperature was 102° F.

The laboratory findings were: R.B.C., 3,690,000; hemoglobin, 62 per cent (Sahli); W.B.C., 16,400. The Linzenmeier tube showed a fall of the cell column to 18 mm. in nine minutes! The column in the Westergren tube fell 147 mm. in one hour! In

addition to these extremely rapid tests the Schilling smear showed 47 per cent immature forms in the blood. Thus all readings indicated a severe infection. Though these tests are not absolutely quantitative, they do in a general way suggest the severity of the infection when such exaggerated figures are obtained.

Despite these readings, after one week of rest there was a rapid improvement in all tests, the blood smear appearing almost normal. Weekly readings showed continued improvement. The temperature and pulse fell to normal one week after admission; the smear three weeks later; and the sedimentation tests reached high normal six weeks later (Table II). During convalescence there was a definite eosinophilia, the smear at that time being thus: basophiles 2 per cent, eosinophiles 10 per cent, immature (nonsegmented) cells 10 per cent, mature (segmented) cells 36 per cent, lymphocytes 39 per cent, and monocytes 3 per cent (Chart 2).

CASE 11.—W. M., male, aged twelve years, was admitted March 31, 1933, complaining of pain in the spine, just below the neck, for three weeks. The pain was so severe that the boy could neither bend his head in any direction nor sleep. There was no fever on admission. Examination showed a marked stiffness of the neck with tenderness on palpation or flexion over the sixth and seventh cervical and third and fourth thoracic vertebrae. The heart was negative. Roentgenograms of the spinal column showed no abnormalities. The laboratory findings were: R.B.C., 4,620,000; hemoglobin, 87 per cent Sahli; W.B.C., 10,000. The temperature was 99.8°F.

The diagnosis was at first obscure. Though the temperature was normal the presence of some active infection was indicated by the Schilling count, which showed 19 per cent immature forms (eosinophiles 7 per cent, immature cells 19 per cent, mature cells 35 per cent, lymphocytes 37 per cent, and monocytes 2 per cent). Both sedimentation tests were rapid, the Linzenmeier reading twenty-five minutes, the Westergren 92 mm. These figures with an eosinophilia suggested the possibility of a rheumatic infection, which was strikingly corroborated about four weeks later (April 28) with the sudden appearance of typical rheumatic nodules over the dorsum of the feet along the tendons and over the knees. At this time the Linzenmeier readings increased slightly from twenty-five minutes to twenty-one minutes, the Westergren remaining unchanged at 90 mm.

On May 5 a new crop of nodules appeared over both knees, at which time all tests showed increasing activity, the Linzenmeier reading seventeen minutes, the Westergren 112 mm., and the immature cells 26 per cent. On May 16 there was still some pain in the neck. The Linzenmeier reading was twenty minutes, the Westergren 77 mm., and the immature cells 29 per cent. On May 27 the Linzenmeier reading was nineteen minutes, Westergren 85 mm., and the immature cells 19 per cent. On June 7 Linzenmeier was forty minutes, Westergren 52 mm., and the immature cells 13 per cent, showing a more rapid approach of the blood smear to normal than the sedimentation tests. By June 23 the Linzenmeier reading was seventy-eight minutes and the Westergren reading 25 mm. At this time, with the tests almost normal, the child was removed from the hospital.

CASE 12.—D. G., male, aged seven years, admitted Sept. 2, 1933, complained of pains in the knees and ankles for one week. The temperature ranged between 100° and 101° F. On examination the slight joint swellings were evident. There was a slight presystolic rumble and a somewhat accentuated pulmonic second sound with no definite murmurs. All tests were moderately increased. The Westergren tube showed 81 mm., and the Cutler rate was 25 mm. in one-half hour. There were 14 per cent immature cells. On September 8 a systolic murmur was heard at the apex of the heart. The Westergren reading was 111 mm., the Cutler 31 mm., and the immature cells were 17 per cent. On September 16 the immature cells were 10 per cent, but rapid sedimentation rates persisted though improved over previous read-

ings (Westergren 64 mm., Cutler 23 mm.). From September 22 to October 13, though the child was at complete rest in bed, a fulminating attack of acute rheumatic fever appeared with migrating joint swellings and rheumatic nodules along the occipital spinal column. The temperature was 103° F.

This acute phase was accompanied by joint and pericardial effusions, which subsided slowly. The temperature fluctuated between 101° and 103° F. for ten days, the pulse between 100 and 140 for three weeks. The tests on October 13, following the acute attack, were as follows: Westergren 71 mm., Cutler 28 mm., immature cells 16 per cent. On October 18 the tests were Westergren 47 mm., Cutler 18 mm., and immature cells 20 per cent, showing an unexplained increase in the Schilling count with improvement in the sedimentation rates. On October 28 the tests were Westergren 40 mm., Cutler 9 mm., and immature cells 8 per cent, showing much improved sedimentation rates with a normal smear. A marked eosinophilia occurred at this point: eosinophiles 15 per cent (!), immature cells 8 per cent, mature cells 34 per cent, lymphocytes 42 per cent, and monocytes 1 per cent.

The sedimentation tests continued to improve slowly, not reaching absolute normal until January 25, throughout which period the blood smear was within normal limits. It took more than four months for the sedimentation rates to reach normal in this case.

CASE 16.—E. R., male, aged eleven years, was admitted January 19, 1935, complaining of acutely inflamed ankles, knees, fingers, wrists, and shoulders for seven days, with temperature mounting to 103.6° F. The joint involvements were migratory. Examinations revealed an acute pericarditis with a friction rub audible over the whole precordium and a double, apical, systolic murmur. R.B.C., 3,460,000; hemoglobin, 68 per cent Sahli (9.8 gm.); W.B.C., 23,200; Cutler, 31 mm.; immature cells, 30 per cent.

Despite this apparently severe involvement, in nine days the temperature and pulse were normal, the immature cells were 11 per cent, a high normal, but the Cutler reading was 29 mm., still rapid. There was a slow improvement in the sedimentation rate, which finally reached normal five weeks after the blood smear (Table II).

CONCLUSIONS

In a convalescent case of acute rheumatic fever, with the subsidence of acute symptoms and signs, the temperature is first to fall to normal, followed by the pulse rate, then the disappearance of immature polymorphonuclear leucocytes from the blood. Last to reach normal is the sedimentation of the erythrocytes. To prevent a convalescent child from getting up too soon, this test should be the criterion of inactivity. No child should be allowed out of bed until the sedimentation test is absolutely normal. This precaution should help to diminish serious cardiac involvement in new cases and minimize increasing damage in children already affected.

SUMMARY

The Schilling blood count and the sedimentation rate and time of the red cells have been studied in twenty normal control cases and in twenty-five children, ill with acute rheumatic fever, with and without evident cardiac involvement. The greater sensitivity of the sedimentation test as an index of inactivity has been demonstrated, and its use as a guide for completed convalescence is urged.

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A PAPILLOMA OF THE CHOROID PLEXUS IN AN INFANT

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THE case which we are reporting is of interest because of the rarity of this type of tumor and the clinical difficulties which were presented.

Baby McL., six months old, male, was referred by Dr. Bernard W. Klippel. He was the second baby, was born spontaneously after a short labor, and at birth weighed 7 pounds and 9 ounces. He was entirely breast fed with the usual auxiliary foods. The mother stated that the baby had been happy and bright and doing nicely until a few days before admission when she noticed that the head seemed to have increased in size. It was later learned that Dr. Klippel had noticed that the head had begun to enlarge two weeks earlier than this. Vomiting had started four days before admission, and during this time he had vomited all breast feedings, orange juice, and water. He had become obstinately constipated. No known fever or illness preceded the enlarging of the head.

The baby was 27 inches long and weighed 16 pounds and 4 ounces; circumference of head was 18¾ inches which, according to the history, would indicate that an increase of about 3 inches in its size had occurred in about four days (this statement being amended at a later date by the attending physician, as stated above). Scalp veins were much distended, and the fontanel was tense, presenting the ordinary picture of an acute hydrocephalus. Besides this the baby was deeply somnolent with a pulse rate of 64. The right pupil was well contracted; the left pupil widely dilated with retinal veins definitely engorged; there was no response to light in either eye. Some slight general spasticity of the entire body was noted giving the impression of being somewhat more pronounced on the right. The abdomen was retracted and the skin doughy. The spleen was not palpable. A typical hydrocephalic cry occurred twice during the examination and supported the very strong first impression of an acute hydrocephalus most probably of tuberculous origin.

An intradermal tuberculin test using 0.1 mg. and a von Pirquet test made the day first seen were negative. A Schilling differential blood count showed a normal, noninfectious picture which, with the absence of a palpable spleen, immediately brought the original impression of tuberculous meningitis into very serious doubt. Besides this, a spinal tap on the following day by Dr. Klippel showed a clear, free-flowing fluid under increased pressure with a normal cell count and a negative Pandy test; no pellicle formed on standing. No organisms were found on smear, and cultures of the fluid were negative. Following the tap, the pupils became equal.

In reviewing this with the history covering the four days, as given by the mother when first seen in the office, one is impressed with the clinical interest attaching to an apparently justifiable diagnosis of tuberculous meningitis, which despite an array of well-complemented signs was not sustained but, to the contrary, could be set aside by the laboratory findings and by the fact that in such cases one feels that he should often be able to detect an enlargement of the spleen. The situation thus became a very puzzling one.

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Read at a meeting of Regions II and III of the American Academy of Pediatrics, Nov. 19, 1935.

AUTOPSY

The baby died ten days later and permission was obtained for examination of the cranial contents only. The fontanels were both wide open and tense, the head showing the typical form of an hydrocephalus. When the skull was opened, the convolutions of the brain, especially over the left parietal and occipital regions, were found to be markedly compressed and atrophic. The brain ruptured spontaneously as it lay on the table, the rupture having occurred through a thinned area in the brain tissue of the left parietal region. A small opening here emitted a large stream of thin, clear, straw-colored fluid which was found to be escaping from the greatly distended posterior half of the left lateral ventricle. There was a reddish papillomatous tumor about the size of a large biscuit arising in the base of the central portion of the left lateral ventricle just posterior to the foramen of Monro and extending through the ventricular cavity where the tumor, together with a flat strip of brain tissue, formed a partition dividing the ventricle into an anterior and a posterior chamber. There was no opening between these two chambers. Both were distended but the posterior portion was distended to such a degree that it gave the impression of being an enormous thin-walled cystic cavity. The foramen of Monro

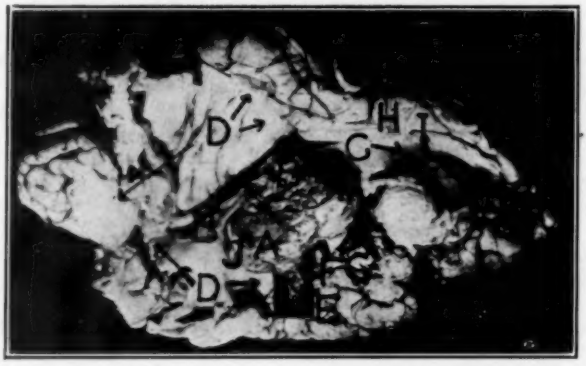

Fig. 1.—Photograph of brain: *A*, showing encapsulated papilloma arising from a narrow strip of brain tissue; *B*, forming a partition in the lateral ventricle; *C*, anterior chamber, and *D*, posterior chamber of left lateral ventricle; *E*, *F*, and *G*, three pieces of choroid plexus attached to the tumor. The majority of the "seed" metastases were situated in the anterior wall of the strip of brain tissue, *B*, near the base of the tumor. (These do not show in the photograph.) *H* shows where a block had been taken including a "seed" metastasis; *I*, a small "seed" metastasis; *J*, capsule of the tumor.

was blocked by the tumor lying over its orifice, causing the anterior portion of the ventricle to become somewhat distended. The tumor had caused some pressure atrophy of the lateral wall of the right lateral ventricle although the septum pellucidum was intact. The pons and medulla were markedly flattened, and there was a distinct pressure collar on the inferior cerebellar surface. The left oculomotor nerve was imbedded in a mass of soft edematous connective tissue. Three small pieces of choroid plexus projected from the main tumor mass, their free ends floating in the anterior chamber of the lateral ventricle. The tumor was completely covered over with a thin enveloping membrane which was continuous with the ependyma of the anterior chamber of the left lateral ventricle. The three segments of choroid plexus which arose from the tumor were apparently not covered over by a membrane. There were eight or ten small implant "seed" metastases in the wall of the anterior portion of the left lateral ventricle. The majority of these were situated immediately adjacent to the main tumor mass in the base of the ventricle although they

were distinctly separate masses. There were also two small "seed" metastases on the superior wall. These "seed" metastases were not found in any other portion of the brain. These secondary tumor masses did not appear to be covered by an enveloping membrane as was the main tumor.

Microscopic sections of the tumor showed it to be a papillomatous tumor composed of branching villi in orderly arrangement with central cores of loose, or sometimes dense, connective tissue in which there were imbedded small thin-walled blood vessels, the epithelial cells which covered the villi being arranged usually in single layers, although in some cases several layers were present. The cells were well differentiated, and no mitoses were seen among them. They were either low or high cylindrical cells with oval or round nuclei situated near the base of the cells. With phosphotungstic acid hematoxylin stain the cells showed coarse, darkly staining mitochondria in the cytoplasm which in some cases were arranged around the nuclei. No glia fibers were present in the tumor, and no blepharoplasts were seen.

Fig. 2.—Low power photomicrograph of the main tumor mass, showing the fibrous tissue stalk of the papilloma at the site of origin from the brain tissue. (H & E stain.)

In spite of the fact that the tumor cells appeared to be very well differentiated, there were occasional small papillomatous and glandlike masses of tumor cells which had invaded the surrounding brain tissue at the base of the tumor to a very slight degree. The sections of the wall of the posterior segment of the ventricular cavity showed it to be lined with a layer of typical ependymal cells.

DISCUSSION

This tumor was considered to be a typical papilloma of the choroid plexus arising from the plexus of the left lateral ventricle. These tumors are relatively uncommon although they are well known in the neuropathologic literature. Davis and Cushing[1] reported six cases in a series of 964 intracranial tumors, a percentage of 0.6 per cent. Van Wagenen[2] in 1930 made an exhaustive review of the literature,

carefully analyzing forty-five cases and adding two of his own. Sachs[3] was one of the first to report a successful surgical removal of one. Although these tumors are typically localized, van Wagenen[1] studied the question of "seeding" and found that in six reported cases this had occurred. Although our case did not show nearly the widespread seeding which occurred in van Wagenen's case, it did show definite small "seed" metastases in the wall of the anterior chamber of the left ventricle.

An unusual feature of this tumor is the fact that it, together with a strip of brain tissue from which it had its origin, formed a complete partition in the left lateral ventricle causing the posterior portion of the ventricle to be completely separated from the anterior portion, leaving no opening between the two chambers. The fact that the posterior part of the ventricle was so extensively distended suggests that the tumor "secreted" cerebrospinal fluid. There was no choroid plexus in the distended posterior portion of the left lateral ventricle, and, since the cyst was filled with what appeared to be cerebrospinal fluid, it seems reasonable to assume that the fluid had its origin from the tumor. The majority of the reported cases have been cystic tumors,[2] and the suggestion has been made that the cysts contain cerebrospinal fluid which had been "secreted" by the papillomatous tumors.

An additional feature emphasized by van Wagenen[2] and borne out in this case, was the fact that papillomas which occur in the lateral ventricles are particularly likely to have an enveloping membrane about them. This feature is very striking in our case.

Another unexplained and curious fact is that this tumor, as well as 93 per cent of the papillomas arising in the lateral ventricles collected by van Wagenen, occurred on the left side.

SUMMARY

A case is reported in which a presumptive diagnosis of acute hydrocephalus of tuberculous origin was based upon the history as given by the parent and the clinical signs. It was found instead to be the result of an enormous distention of the lateral ventricle caused by a papilloma of the choroid plexus which arose from the floor of the ventricle and obstructed the foramen of Monro on one side. The importance of the Schilling differential blood count, the spinal fluid examination, and the need for considerable reserve in the diagnosis of acute hydrocephalus are emphasized in this case, as well as the necessity of avoiding pitfalls of this sort that the surgeon might save a life.

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A SIMPLE MECHANICAL METHOD FOR THE TREATMENT OF ENURESIS IN MALE CHILDREN

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ENURESIS is one of the most common disorders encountered in pediatric practice. While its etiology may be found at times in anatomic or physiologic abnormalities, a review of which is beyond the scope of this communication, the great majority of pediatricians believe the disorder to be of functional origin, based in most cases on faulty habit training or other abnormal psychologic states. The reason pediatricians hold this belief is that most children can be cured of enuresis by the methods ordinarily used, perhaps the most common being that of awakening the child at regular intervals during the night and making him go to the toilet fully awake with the knowledge of why he has been awakened. The fundamental basis of success in this method is making the condition a nuisance to the child as well as to the parents, and thus stimulating in the child a desire to control his bladder. Other methods—as forms of bribery, in which a reward is promised for success, reasoning with the child, appealing to his pride, a change of environment—all procedures affecting purely the psyche, also occasionally meet with success.

Various mechanical measures have been devised from time to time and have met more or less success, but there is no one mechanical method which has met with universal approval. The procedure about to be described resulted from the constant stimulus of a mother driven desperate by the constant bed wetting of her seven-year-old son, who, according to her, had not missed a night since he was born. In reviewing the literature in the attempt to find some method of controlling this boy in whom all procedures had met with failure, we were impressed by the communication of Bonjour.[1] He stated that the best method of treating the condition is by hypnotism, which is impractical in childhood. He reported success by sealing the prepuce with adhesive. If this is properly done, urine does not escape from the urethra, and when the bladder is full enough to give rise to a sensation of discomfort, the child will awaken and in this manner gradually be educated to control the bladder. Girls were treated similarly by sealing the labia majora together with adhesive.

After a number of experiments the following modification of this method was adapted for the use of male children. A section of Pen-

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rose rubber tubing of a size which will slip comfortably over the shaft of the penis is chosen. This is cut so that, when fitted over the length of the penis within 0.5 inch of its base, the free end will project from 2 to 2.5 inches beyond the tip. The tube is sealed to the base of the penis by means of an adhesive band covering both the rubber and the skin. This is the most difficult part of the technic, for, if improperly done, leaks readily occur here. The free end of the tube is closed by folding over about 1 inch and sealing this by means of a small rubber band. The details of the procedures are illustrated in Figs. 1 and 2. The method is explained to the child who can in most cases readily understand why, with this "raincoat" in place, he cannot possibly wet the bed; this suggestion is very important for the early success of the method. If, after the child goes to bed, urine is passed into

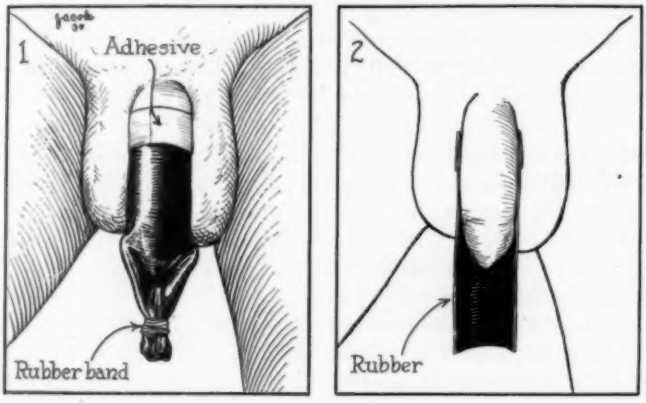

Fig. 1.—The apparatus in place.
Fig. 2.—Hemisection of the rubber tube and adhesive showing their relationship to the penis.

the rubber tube, it cannot escape into the bedclothes, and he awakens either, as it is usually expressed, from a sense of weight between his thighs or because of the feeling of a distended bladder. He may then either call his parent or, preferably, go to the toilet himself, release the rubber band at the end of the tube, pass his urine, and go back to bed. Older children may be taught to reseal the tube with the small rubber band.

This simple method succeeded brilliantly in the original case which stimulated its application, as well as in a number of other cases of persistent enuresis. We believe, however, that, while in some cases success is obtained because of the mechanical principles involved, in most cases the effect of the method is psychologic. Many boys cease wetting the bed after the first application of the tube without ever having wet it. The method will not succeed in the case of feeble-

minded children who cannot cooperate or so-called normal children who will not cooperate. It is too easy to tear the rubber or loosen its connections. We are assured by a competent genitourinary authority that the danger of infection from backflow of urine into the bladder is negligible. The tube does not appear to cause or increase a tendency to masturbation. We have had no experience with the application of the principles of this method in girls.

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ATRESIA OF THE VULVA IN CHILDREN

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DURING the past two years we have encountered several cases of cohesion of the labia minora in young females. Due to the apparent frequency of this condition and due to the fact that it may be a factor in producing chronic urinary obstruction, this anomaly deserves consideration.

In American literature there has been little mention made of the condition. The standard pediatric and urologic texts do not refer to it. One of us, in 1934, reported one case in a child twenty-five months of age.

The foreign literature is fairly extensive. R. Lederer, in 1929, reported a case in a child two years of age. In 1930, Vakar reported fifteen cases of this type seen in one year, the ages ranging from three months to two and one-half years. In 1934, H. Schlack reported six cases. There have been other reports in the Italian and in the French literature which have not been available to us. Cases persisting into adult life have been reported by J. B. Hellier in 1914 and Margaret Salmond in 1930.

ETIOLOGY

The question arises as to whether this condition is congenital or acquired. We have never seen it in the newborn. Two of the patients reported here were examined at birth, and the genitals found to be normal. These facts would lead us to believe it is an acquired and not a congenital anomaly.

In the development of the female genitals each of the labia minora is developed separately from a genital fold. These genital folds are developed from the lips of a groove on the extremity of the genital tubercle, a structure which appears approximately in the fifth week of life. Since at no time during development is there fusion of the genital folds, one might assume that atresia of the vulva is not due to any inhibition of normal development in the embryo as is the case in atresia of the vagina.

None of these cases has given any history suggesting either a gonorrheal or a nonspecific vulvitis, and in none was vulvitis present at the time of the examination. However, due to the richness in cellularity of the labia minora in young girls and due to the fact that the labia minora lie in close contact in early life, particularly in the posterior portion, it is probable that a very mild inflammatory reaction might later cause an agglutination of these structures without any marked signs of a vulvitis.

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Vakar believes that in the cases studied by him there must have existed previously a vulvovaginitis or a vulvitis. In 47 per cent of his cases vulvitis was present at the time of examination. In his opinion the physiologic desquamative vulvovaginitis of the newborn plays an important rôle, in that this physiologic catarrhal inflammation may serve as a predisposing factor for the penetration of pathogenic organisms, which is eventually followed by infection and adhesions.

From the above it would appear that the described anomaly is post-inflammatory in character following a previous mild vulvitis. The fragility of the adhesions found would tend to bear out this contention.

SYMPTOMS AND SIGNS

Two of the cases reported have presented no symptoms referable to this disorder, the condition being found as a part of routine examination.

Urinary disturbances, found expressed in the form of interruption of the stream, were observed in six of these cases. Tenesmus and frequency were present in all of these. In one case a chronic pyelocystitis of nine months' duration was apparently due to this form of obstruction. Residual urine in the bladder and in the vagina was noted in this same case. No pruritus nor tendency to masturbation has been noted by us. In this small series, the youngest noted was eighteen months old and the oldest three years old.

On physical examination the condition is easily recognized. On separating the labia majora, the labia minora are found sealed together by a thin, bluish, almost transparent membrane. Anteriorly there is a small pinpoint opening just below the clitoris through which the urine is passed. This opening is posterior to the clitoris, but well anterior to the external urethral orifice, so that in effect there is a diaphragm which tends to obstruct efficient emptying of the bladder. In two of these, two to three minute perforations in the membrane were seen in about the midposition.

Micturition in one case was accomplished only with great difficulty; the child apparently filled the vagina with urine and then slowly expelled it through the opening below the clitoris.

TREATMENT

Simple separation of the labia minora has been effective in these cases, accomplished either manually or by use of a probe. The slight bleeding which occurs is easily controlled by pressure. A bland ointment is prescribed to prevent agglutination of the raw edges. We have so far seen no recurrences.

CASE REPORTS

CASE 1.—B. G., aged two and one-half years, was seen Nov. 14, 1933. For nine months she had had frequent attacks of "pyelitis," characterized by high fever, vomiting, abdominal pain, and marked frequency of urination. The attacks occurred about every two weeks and lasted from three to five days. Her urine had been examined frequently and was always found loaded with pus. Varied medication had been given without benefit. The patient had lost weight, had a poor appetite, and was extremely irritable.

Examination revealed a thin, active child, not acutely ill. She weighed 25 pounds. The temperature rectally was 99.4° F. Abdominal findings were limited to the genitals. When the labia majora were separated, the labia minora were found to be adherent throughout, except for a pinpoint opening posterior to the clitoris but well anterior to the urethra. Traction on the labia produced the appearance of a thin, semitransparent membrane completely occluding the introitus. During the examination a small amount of urine was passed with obvious effort. The adhesions

Fig. 1.—Case 3. Atresia vulvae.

were separated digitally and boric acid ointment applied to the denuded surface. A 10 F catheter was passed into the bladder and 80 c.c. of residual urine obtained. All symptoms immediately disappeared, and there was been no recurrence over a period of eighteen months.

CASE 2.—T. O., aged three years, was seen on Jan. 18, 1934, because of fever, pain on urination, and frequency of four days' duration. The urine was loaded with pus. General physical examination was negative, but on separation of the labia majora complete atresia of the labia minora was found, with a minute opening posterior to the clitoris, as in the above case. Manual separation was performed with ease. Symptoms subsided promptly, and there has been no recurrence in over a year.

CASE 3.—G. D., age two and one-half years, was seen on May 16, 1935, because of listlessness, poor appetite, and painful frequent urination of two days' duration. On examination the labia minora were found adherent throughout except for a small opening adjacent to the clitoris (Figs. 1 and 2). This child had been seen

regularly since birth, and the adhesions were known not to have been present up to four months before this examination, when she was last seen. Prompt disappearance of symptoms followed separation of the labia, and there has been no recurrence to date.

CASE 4.—M. G., aged eighteen months, was seen on Feb. 5, 1934, because of frequent painful urination of two days' duration. Examination disclosed labial adhesions as described above, and separation was followed by prompt cessation of symptoms. This child, too, had been seen regularly since birth and is known to have been normal up to four months before the present examination.

CASE 5.—B. C., aged six months, was seen on March 11, 1935, because of frequent, painful urination. Labial adhesions closed the entire introitus except for a small opening adjacent to the clitoris. Manual separation was performed with ease, and all symptoms promptly subsided.

CASE 6.—S. O., aged five months, was seen on Nov. 25, 1934. For about a week she had cried out on urination, as though in severe pain. So far as the mother

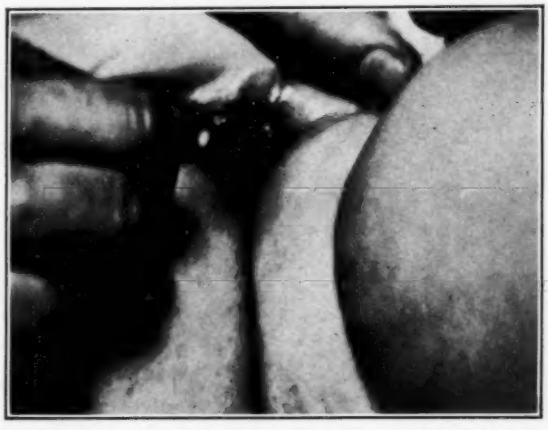

Fig. 2.—Case 3. Condition after separation of the labia minora.

knew she had had no fever. Examination was negative except for complete adhesion of the labia minora, as in the above cases. There was only a pinpoint opening present. After the labia were separated with a probe, the symptoms cleared up quickly.

CASE 7.—J. H., aged seven months, was seen on Nov. 30, 1933, for routine examination. The labia minora were found adherent throughout except for a small opening next to the clitoris. There had been no symptoms. Separation was accomplished easily with a probe, and to date there has been no recurrence of the adhesions.

CASE 8.—G. S., aged nine months,, was seen on May 8, 1934. She was perfectly well and had had no urinary symptoms. Routine examination revealed labial adhesions as described. The adhesions were separated with a probe and have not returned to date.

CONCLUSIONS

1. Eight cases of atresia vulvae or cohesion of the labia minora have been observed in the past two years.

2. The condition seems to be acquired rather than congenital and is not associated with any other defect.

3. Treatment consists of separation of the labia minora either manually or by use of a probe.

4. The condition may be asymptomatic or may produce symptoms of urinary tract obstruction.

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CALCIFIED ABDOMINAL GLANDS IN CHILDREN

A Clinical Study

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DESPITE the numerous publications on the occurrence of calcified abdominal glands and the symptoms which may arise from them, questions as to the management and prognosis of this syndrome continue to be difficult to answer. The present study was undertaken in an attempt to evaluate our experience with this clinical finding in 147 children seen in the medical and surgical clinics and the private ward of the Children's Hospital.

In older works on tuberculosis of the mesenteric glands emphasis was placed upon states of actual inflammation, the so-called "tabes mesenterica." This condition as a clinical entity is apparently less frequently seen than formerly. It is not dealt with in the present paper. On the other hand, interest in calcified and supposedly inactive abdominal glands has been increasing since Dunham and Smythe[1] pointed out the accuracy and ease with which such glands could be identified roentgenologically. The literature contains numerous case reports of acute and chronic abdominal symptoms and diagnostic problems arising from such glands.[2, 3, 4, 5, 6] Their etiology and epidemiology as unsuspected, nonthoracic foci of tuberculosis have been discussed in another paper.[7] Finally there have been a few general analyses of large groups of cases from all approaches. The reader is referred particularly to the monograph by Strömbeck,[8] in which a full bibliography will be found. No attempt at such a review is made in the present communication as much of the literature is repetitious or consists of reports of single or few cases. Some authors combine the three subjects of nontuberculous mesenteric adenitis, active tuberculosis of mesenteric glands, and calcified mesenteric glands. It should be repeated that the present study is concerned only with children who present the last-named condition.

Our material consists of the records of 147 children with demonstrable calcifications of the abdominal glands, seen at this hospital during the past ten years. By questionnaires and return visits the present status of all but sixteen of the group has been determined. While our main interest has been in determining whether and in what manner these glands affect the well-being of children, and how they should be treated, we have been secondarily interested in their frequency, their relationship to other tuberculous processes, and their original source of infection.

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ETIOLOGY AND ROENTGENOLOGIC APPEARANCE

Various conditions may produce abdominal shadows of calcium density, but an old tuberculous infection of the mesenteric glands would appear to be much the most common one in childhood. We have tried to exclude from our study children in whom there were evidences of some cause other than the tubercle bacillus. In all children who were tested with tuberculin (119 of the series) the reaction was positive. It is difficult to give exact data as to the frequency with which the condi-

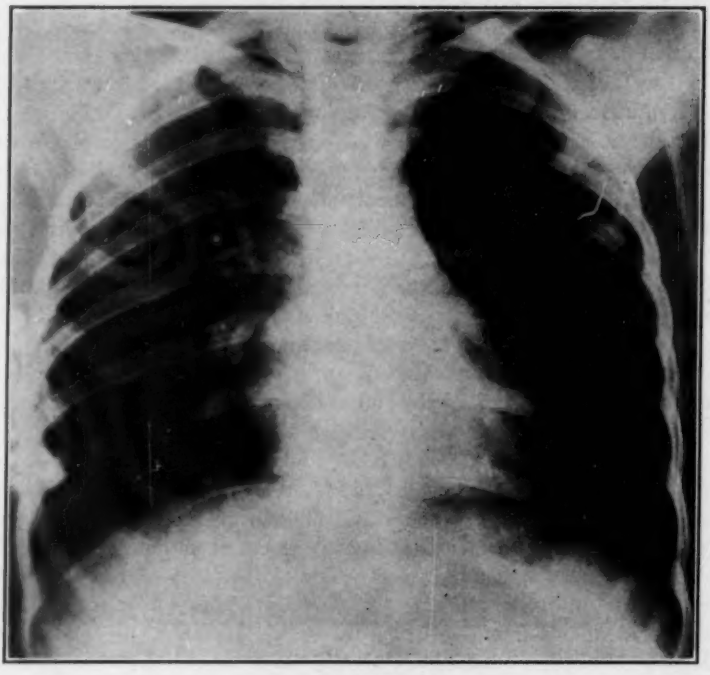

Fig. 1 *A*.

Fig. 1 *A* and *B*.—Numerous calcifications in chest, abdomen, and pelvis of a girl of 11. Recurrent abdominal pain for one year before. At 18 years is still having mild and infrequent pain. Note calcified gland to right of lower coccyx. (See opposite page for Fig. 1*B*.)

tion occurs. It appears to vary considerably with the locality in which surveys are made, as has been pointed out in the literature.[1, 2, 7] From our experience and from that of Dunham and Smythe[1] and Gibson,[7] the frequency must be comparatively high in southern New England. At the Infants' and Children's Hospitals, such glands have been found in between 1 and 2 per cent of abdominal roentgenograms of patients between the ages of two and twelve years. Obviously, when such examination is confined routinely to tuberculin-positive children, the percentage may be considerably higher.

Because the child who presents this condition must be considered as having a past or potential tuberculosis, it is of interest to consider the relationship of these glands to tuberculous processes elsewhere in the body. In the majority of our patients we have roentgenologic data as to the condition of the chest. These are summarized in the first part of Table I; in the second part are given data on the nonthoracic tuberculous

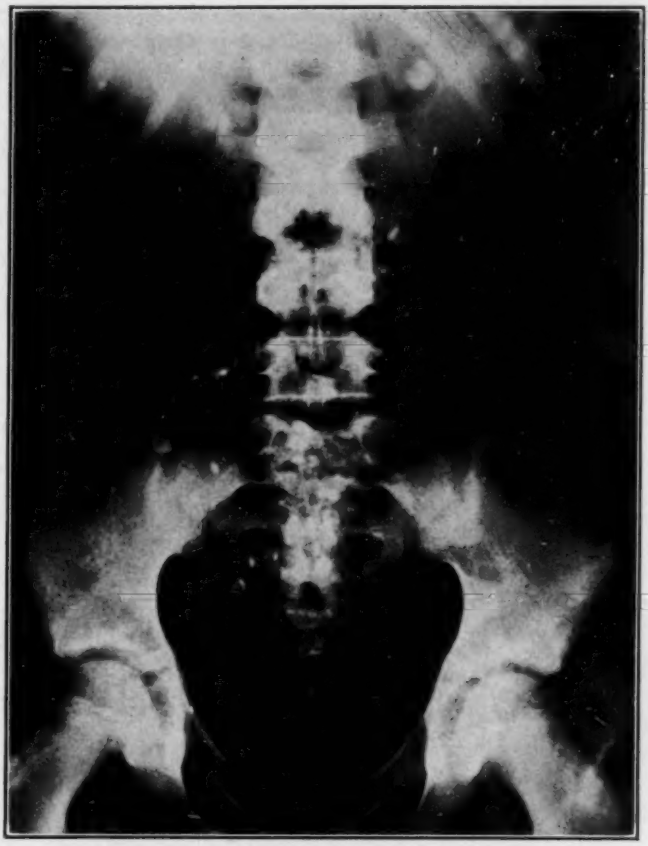

Fig. 1*B*.—See legend under Fig. 1*A*.

lesions of the group as a whole. Examination of Table I shows that, while some evidence of old pulmonary and hilum tuberculosis was found, there was only one child in whom this seemed to be active. We have seen no pulmonary or hilum tuberculosis develop in the subsequent course of any patient. There were a few children whose chest x-rays showed several scattered pulmonary and regional hilum calcifications.

In such cases the abdominal plates often showed numerous areas of calcification (Fig. 1 *A* and *B*). These children apparently had at one time a widespread tuberculous infection, though, because of the equal degree of calcification in the chest and abdomen, it is not possible to state whether infection in either region was secondary to that in the other.

As shown in the table, some of the evidence of intrathoracic tuberculosis was considered by the roentgenologist as questionable. There was definite positive evidence in a total of fifteen patients, or 13.8 per cent of those whose chests were x-rayed. The association of nonthoracic tuberculosis occurred in a larger number (twenty-six) of the 147 children. In cases in which this infection was in the bones, joints, cervical glands, skin, or bowel, it apparently preceded the abdominal glandular lesions or was contemporaneous with them, with the exception of one child in whom a tuberculous lesion developed in the right acetabulum a few months after calcium was first found in the abdominal plate.

TABLE I

TUBERCULOSIS ASSOCIATED WITH CALCIFIED ABDOMINAL GLANDS

A. Pulmonary and Hilum. (Roentgenograms of 109 Children)

	NONE	QUESTIONABLE	DEFINITE		TOTAL DEFINITE THORACIC LESIONS
			OLD	ACTIVE	
Number	83	11	14	1 (hilum)	15
Per cent of 109	76.2	10.1	12.8	0.9	13.8

B. Nonthoracic. (History and Examination of 147 Children)

	NONE	CERVICAL GLANDS	BONES AND JOINTS	PERITONITIS	SKIN	INTESTINAL	MENINGES	TOTAL NONTHORACIC
Number	121	9	6	7	1	1	2	26
Per cent of 147	82.4	6.1	4.1	4.7	0.7	0.7	1.3	17.6

It will be noted from the table that two children had tuberculous meningitis. These represent the only deaths from tuberculosis in the entire series. In both, the calcifications were first discovered at the time of admission with meningitis and had produced no local symptoms. One patient was a girl of five years, who showed no clinical or roentgenologic evidence of tuberculosis except in the meninges and abdominal glands. The glands were solidly calcified. The other child was an infant of eighteen months, heavily infected from a consumptive mother. A large pulmonary infiltration had been noted in this child's chest a year before. It had cleared almost entirely at the time meningitis and early calcification of glands were discovered. Unfortunately, autopsy

was not permitted in either child. No miliary dissemination was discoverable by x-ray plates in either one. It seems probable that in both of them the meningitis arose from an isolated tuberculoma in or near the central nervous system. It would seem unlikely that an abdominal focus could give rise to meningitis without also producing a generalized miliary spread.

The association of manifest tuberculous peritonitis deserves separate comment. It was present in seven of our patients. In all of these the peritonitis was observed in the hospital. In two of the seven children, calcium was first found in the abdomen from four to five years later; in the other five, the conditions were found simultaneously, and in them the calcification consisted of a partial flecking or outlining of the gland as shown by roentgenogram. In our experience tuberculous peritonitis has not developed in any child after the presence of calcified glands was discovered. This statement is based on the 131 children we have been able to follow, of whom fifty-two have been under observation for from six to ten years. We infer that while glands which are beginning to calcify may disseminate bacilli to the peritoneal surfaces, a child whose roentgenograms show solidly calcified shadows is in little if any danger of peritoneal involvement. Our findings also indicate the likelihood that associated tuberculous lesions usually arise from the same source as that responsible for the mesenteric gland infection rather than as later secondary disseminations from these glands.

Certain evidences are shown in patients in this series that the source of infection is often contaminated milk. There was a rather infrequent history of household contact with tuberculosis. This background was definite in only fifteen children (10.2 per cent), doubtful in an equal number, and absent in 117 of the group. Of the fifteen known contacts, six were with persons with bone, gland, or renal tuberculosis. It is possible that the members of these families may have acquired their infection through the family milk supply. We have less data concerning the milk supply of the total group than concerning their exposures, but in the forty-seven instances in which this is recorded, there was a history of raw milk in the diet of thirty-four patients.

The children have in general come to the hospital from the smaller outlying communities, where milk production is often unregulated. Figure 2 shows the distribution of their homes as contrasted with those of a comparable group seen in the hospital with primary pulmonary tuberculosis in the same period of years. A much larger number of the latter group have come from the city of Boston, where, though chances for contact with diseased individuals is greater, the milk supply is well controlled. Twenty-two children in our series were patients in the private ward, and are included in this study through the courtesy of their private physicians. It is possible that these children, from the

more fortunate social classes, have had opportunities to visit in rural districts where there is less pasteurization of milk.

The evidence that ingested tubercle bacilli may pass through the intestinal wall to the associated lymph glands without producing actual

Fig. 24.—Location of homes of children with calcified abdominal glands. Eighty-five in outlying towns, 68 in Boston area (in insert), 17 in city of Boston.

intestinal lesions is considerable. In only one of our patients, a boy aged ten years, do we know of the presence of bacilli in the stools. This child had a history of passing bloody stools for a period of five months before

he came to the hospital. His tuberculin test was positive; the roentgenograms of the chest were negative; and a flat plate of the abdomen showed several calcified glands. He was withdrawn from the hospital before our own bacteriologic study of the stools was completed, but a tentative

Fig. 2B.—Location of homes of children with primary pulmonary tuberculosis. Forty-one in outlying towns, 100 in Boston area, 53 in city of Boston.

diagnosis of tuberculous colitis was made although two examinations with barium by rectum and one with barium by mouth were negative. He went, after a few weeks, to another hospital where blood and tubercle

bacilli were repeatedly found in the stools, and he recovered without further evidences of tuberculosis on a routine sanatorium treatment. This is the only one of our patients in whom evidence of actual intestinal lesions was present, and we cannot be sure that in this child the active intestinal lesions stood in a causal relationship to the calcification in the glands, or that the reverse might not have been true.

In a study of necropsy material, Leonard[9] found intestinal lesions in only a third of forty-eight children, all of whom showed tuberculosis of the mesenteric glands. Moreover, it is of interest to note that while there is usually a considerable involvement of the abdominal glands during the course of a true tuberculous peritonitis, in two of our patients with peritonitis only three calcified glands could be demonstrated in the abdomen four years later. There must frequently be lesions of tuberculosis in abdominal glands and possibly in the intestinal wall, which heal perfectly or at least become entirely quiescent. In the case of the glands, it is likely that this may occur without any ultimate calcification. At all events, we feel that a child whose roentgenogram of the abdomen shows calcified glands usually represents an original tuberculous infection by ingested bacilli. Unless such a child continues to ingest bacilli, the danger of further and more active tuberculosis elsewhere in the body would appear to be slight. The possibility of meningeal involvement from an associated lesion can never be ignored.

The roentgenologic appearance of calcified abdominal lymph nodes has been described many times and is quite typical. In a child with one doubtful shadow, a second examination made after a few days, and with the bowel empty, is obviously an essential procedure. With the corroborative evidence of this procedure and a positive tuberculin test, there have been no cases in our series in which the diagnosis was in doubt. The shadows range in size from flecks of a few millimeters, often grouped in small aggregations, to ringlike or irregular "mulberry" shadows up to 2 cm. in diameter, and sometimes larger. We have found as many as twenty in one film (Fig. 1 *A* and *B*), though most frequently there are from one to three. Tabulated data as to roentgenographic findings in the two largest groups of patients are given in Table II and will be referred to later.

CLINICAL FINDINGS

In studying our 147 patients from the point of view of their symptoms and treatment, we have first subtracted the seven patients who had at some time tuberculous peritonitis. These children have been discussed above. This leaves 140 children in whom the findings may be laid more definitely to the glands themselves (Table III). The first group of these contains sixty-nine children who were symptom free or presented complaints explained by other findings than the glands. The second group

contains seventy-one children with symptoms, unexplained except by the presence of calcified glands.

TABLE II

RELATION OF PAIN TO NUMBER, SITE, SIZE, AND DEGREE OF CALCIFICATION OF GLANDS IN AVAILABLE ROENTGENOGRAMS (PERCENTAGES IN PARENTHESES)
GROUP I—64 CASES WITHOUT SYMPTOMS
GROUP II—59 CASES WITH PAIN

	A. Number of Glands				
	1	2	3	4	MORE THAN 4
Group I	12 (18.8)	17 (26.3)	13 (20.4)	4 (6.2)	18 (28.2)
Group II	18 (30.5)	14 (23.8)	17 (28.8)	3 (5.1)	7 (11.8)
Totals	30 (24.4)	31 (25.2)	30 (24.4)	7 (5.7)	25 (20.4)

	B. Size of Largest Gland Shadow			
	UNDER 5 MM.	5-10 MM.	10-20 MM.	MORE THAN 20 MM.
Group I	7 (10.9)	18 (28.2)	27 (42.2)	12 (18.7)
Group II	4 (6.8)	18 (30.5)	31 (52.5)	6 (10.2)
Totals	11 (8.9)	36 (29.2)	58 (47.2)	18 (14.7)

	*C. Region of Abdomen**			*D. Degree of Calcification**		
	RT.	MIDDLE	LT.	FLECKS	OUTLINE	SOLID
Group I	45 (62.5)	3 (4.2)	24 (33.3)	17 (23.9)	38 (53.5)	16 (22.6)
Group II	38 (56.6)	2 (3.0)	27 (40.4)	24 (38.7)	24 (33.7)	14 (22.6)
Totals	83 (59.6)	5 (3.6)	51 (36.8)	41 (30.8)	62 (46.6)	30 (22.6)

*Different types of glands in the same plate are each listed.

Somewhat more than half of all the patients were girls. The youngest child was the eighteen-month-old boy, who had tuberculous meningitis at the time the calcified glands were discovered. In autopsy studies Leonard[9] found calcification in the mesenteric glands of infants as young as six months. The average age of our patients at the time of the first positive roentgenogram was 7.7 years.

The first group of sixty-nine children need be mentioned only briefly.

TABLE III

DISTRIBUTION OF CASES

CLASSIFICATION	NUMBER	%	BOYS	GIRLS	AVERAGE AGE AT DISCOVERY OF GLANDS
WITH PERITONITIS	7	4.7	4	3	6.4 YR.
1. No symptoms	69	46.9	30	39	7.6 yr.
2. Symptoms unexplained except by glands	71	48.4	30	41	8.4 yr.
Totals	147	100	64 (43.5%)	83 (56.5%)	7.7 yr.

They are of importance as an indication of the frequency with which unsuspected tuberculous infection may leave a residue of asymptomatic calcium in the abdomen. That the outlook in such children is good is shown by our follow-up of these patients. We have followed twenty-six for a year or less, twenty-five for one to five years, and eighteen for six to ten years. Three have died of nontuberculous disease, one of

sepsis, one of leucemia, and one of malignant lymphoma. Two others died of tuberculous meningitis as mentioned above. Of the remaining sixty-four, three have developed occasional mild abdominal pains. In one of these the symptoms cleared after recurring for one year. In the other two there are still transient pains. In the great majority of the group the glands have never given rise to symptoms or alterations in healthy growth, and these children have received no antituberculous treatment beyond general hygiene and advice to the parents as to the safety of the milk used. Thirteen children in this group had been operated on at some time for appendicitis. The glands occasionally were discovered in preoperative roentgenograms. In all these patients the pathology in the appendix explained the symptoms which led to operation, and such symptoms were relieved thereafter.

The seventy-one children with symptoms attributable to the glands form our largest group. Table IV shows the duration and ultimate outcome of symptoms in this group, as well as the length of the time we have observed them since the first discovery of calcified glands. Several are now in their later adolescence, and a few are over twenty years of age. The majority of those whose symptoms are listed as not having cleared are only mildly or occasionally disturbed by them.

TABLE IV

PRESENT STATUS OF CASES WITH SYMPTOMS

DURATION OF SYMPTOMS		OVER 2 YR.		1-2 YR.		6-12 MO.		1-6 MO.		UNDER 1 MO.	
STATE OF SYMPTOMS		CLEARED	PRESENT	CLEARED	PRESENT	CLEARED	PRESENT	CLEARED	PRESENT	CLEARED	PRESENT
Followed 6-10 yr.	(33)	6	8	4	0	4	0	5	0	6	0
Followed 3-5 yr.	(6)	0	1	1	1	1	0	0	0	2	0
Followed 1-2 yr.	(13)	0	0	6	1	2	0	2	0	2	0
Followed 6-12 mo.	(9)	1	0	0	0	2	0	5	0	1	0
Followed less than 6 mo.	(10)	2	0	1	0	1	0	0	0	6	0
Totals	(71)	9	9	12	2	10	0	12	0	17	0
Totals		18		14		10		12		17	

In sixty-three of these children the main complaint was of abdominal pain. While the manifestations of such a symptom in such a large group of cases are too varied for description or tabulation, a few short case abstracts will suggest the ordinary picture:

CASE 1.—M. F., a girl six years old, was brought to the hospital because of abdominal pain for six months. There was a history of the use of raw milk from a nontested herd. The family history was negative. Pain had occurred in attacks lasting from a few minutes to half an hour, almost daily, unrelated to meals. It was localized to the midabdomen, was severe enough to make her double up and had been associated with vomiting only three times. Tuberculin test was positive: roentgenograms of the chest were negative; those of the abdomen showed

several large calcified glands to the right of the midabdomen (Fig. 3). With rest in bed for the next three months, pain became more transient but persisted. At one time slight spasm was found in the right lower quadrant, and a few indefinite masses were palpated there. During the next year with increasing activity allowed, pains became as rare as only twice a month with occasionally more frequent recurrences. Three roentgenograms during the year showed no change in the abdomen. Her general physical condition has been steadily good. She is still under observation, but not seriously disturbed by her pains.

CASE 2.—J. Mi., a nine-year-old boy, had received raw milk for two years after weaning; there was no tuberculosis in the family. Eight months before admission

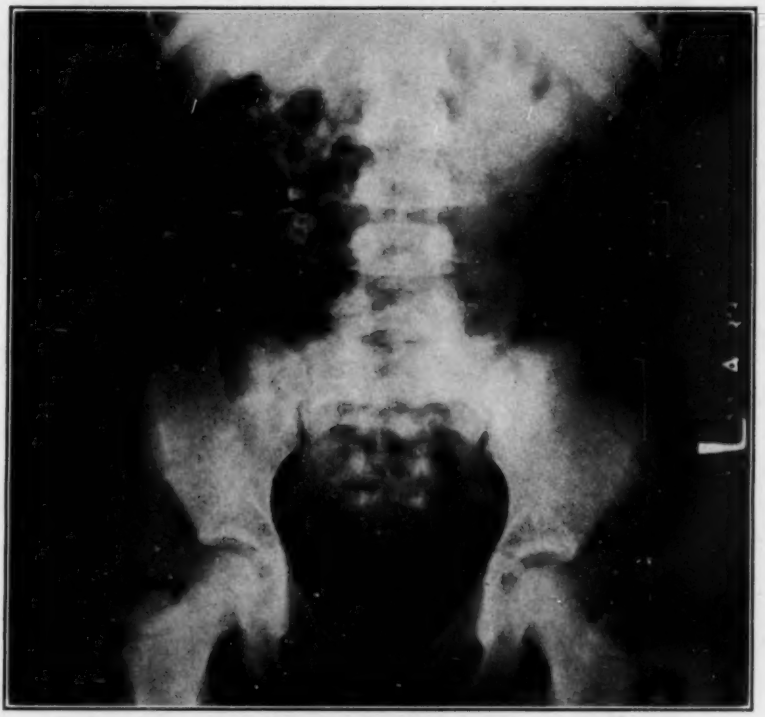

Fig. 3.—Case 1 in text. Calcified glands associated with recurrent abdominal pain in a girl six years old. Responding to rest and hygiene.

he had suddenly been seized with severe cramping abdominal pain while playing. This lasted ten minutes. Since that time he had complained of similar pain once or twice weekly, usually brought on by running or overeating, and occasionally radiating to the left lower quadrant. Vomiting had occurred once. Examination of the abdomen was negative, as was the general physical examination. Tuberculin was positive; a chest roentgenogram showed a little calcium at the hilum, and a flat plate of the abdomen showed a large mass of calcified glands in the right lower quadrant (Fig. 4). He was sent home on a modified rest regime, on which he was free of pain until six weeks later, when he had severe abdominal pains most of one night after spending the day digging a garden. Since that time he has been followed for nine months without pain.

CASE 3.—J. Mc., a boy aged two years and three months. Three of his siblings had been seen in the hospital, one with tuberculous peritonitis, one with tuberculous hip disease, and one with calcified abdominal glands. He was admitted to the ward because of painless abdominal distention of two days' duration, which responded to an enema and did not recur during two weeks of observation, or thereafter. The spleen and liver were palpable. Tuberculin test was positive; a film of the abdomen was negative at this time, and one of the chest showed peribronchial congestion. Advice as to safeguarding the family milk supply was given.

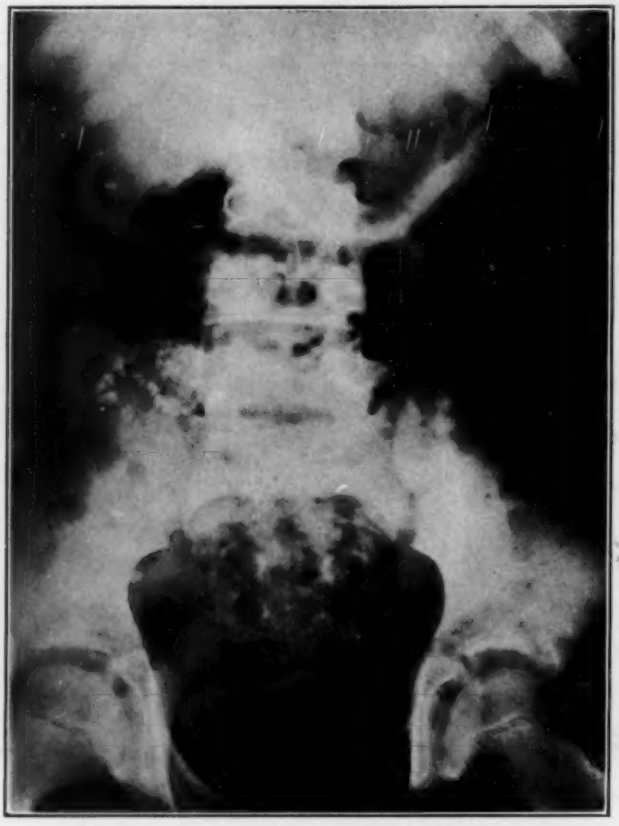

Fig. 4.—Case 2 in text. Nine-year-old boy with symptoms of recurrent pain on exertion, ceasing on moderate rest therapy.

He had no symptoms for seventeen months and then began to have attacks of abdominal pain two or three times daily, severe enough that he sometimes cried out with it. It was not related to food or to the state of his bowels, and he did not vomit. After a month of this pain he was reexamined. There were no findings except that a repeated film of the abdomen showed a large partly calcified gland to the right of the fourth lumbar vertebra. Treatment consisted of moderate rest and sun baths. In nine months since then he has had only one attack of pain.

These three children illustrate the tendency of the pain to be recurrent over prolonged periods of time, without relationship to meals,

and to be brought on by fatigue or strain. Its location and the findings upon physical examination are discussed below. Besides their pain, these patients have sometimes been nauseated, and in a few instances there have been severe attacks of vomiting. With acute attacks of pain, parents have sometimes reported that the children were feverish, but temperatures above 100° F. have not been seen in the hospital. In general, these sixty-three children have not as a group been malnourished, anemic, or easily fatigued.

Eight other children have been included in this group as having complaints unexplained by examination except as they might be related to the presence of such glands. Their symptoms form a miscellaneous collection which may be summarized briefly as follows: Two children had low back pain of one and five years' duration; one had weight loss and urinary frequency (for two months); one had urinary frequency and slight fever (for one month); one hematuria (five attacks in two years); one anorexia, nausea, and diarrhea (for two months); and in two there were malnutrition, nausea, and night sweats for one and two years.

In those children whose symptoms were of a general nature, as in the last three mentioned, it is possible that the calcified glands were part of a tuberculous process still active enough to disturb general health and perhaps not entirely localized in the abdomen, though examinations of other parts of the body were negative. As in all of the children with miscellaneous symptoms, no other diagnosis could be made, and the symptoms have cleared under moderate rest and good hygiene.

In the others, we cannot prove any mechanical relationship between the presence of calcified abdominal glands and such varied complaints as back pain, hematuria, and urinary frequency. It is quite possible that no such relationship existed. Back pain has not been mentioned in the literature except as pain may be referred to the back from the abdomen. Many authors, notably Thomson-Walker,[10] have thought that calcified glands might cause hematuria and other urinary disturbances. Their evidence has been criticized by Strömbeck.[8] In our patient with hematuria, pyelograms did not demonstrate a topographic relationship between the glands and the ureters or kidneys, and the urine was negative for significant organisms on culture and inoculation. One child with urinary frequency had a negative cystogram and a bacteriologically negative urine. The other cleared up before complete studies were made. All the children with urinary symptoms recovered without special therapy, and in none have later disturbances or findings indicated a different diagnosis.

ETIOLOGY OF PAIN

Since the most consistent symptom accompanying the presence of calcified glands is abdominal pain, considerable speculation has arisen

as to the manner of its production. The subject has been reviewed recently by Mead.[11] Golden and Reeves[2] and Auchincloss[3] discuss the usual theories. Most explanations are based upon peritoneal irritation, either inflammatory or mechanical; mechanical irritation of sympathetic nerves; the associated presences of adhesions, bands, and contractures, as well as possible active intestinal or mesenteric lesions; and finally damage to the lymphatic or vascular drainage of a part of the intestine, with the substitution of a makeshift, compensatory mechanism. Auchincloss mentions the possible rekindling of allergic areas in these nodes by reinfection of a tuberculous nature. Attempts have been made in nineteen of our patients to determine the cause of pain by gastrointestinal barium series. In sixteen the findings were negative; in two there was some visceroptosis; and in one a hypermotility was found. This same child had a negative series a year later, when she was still having symptoms.

Our material offers two fairly large and fairly equal groups of cases, one with definite abdominal pain and one without symptoms. We have reviewed the available roentgenograms in these two groups in an attempt to learn whether any particular size, degree of calcification, site, or number of calcified glands is particularly likely to be associated with pain. The results are analyzed in Table II. It is to be noted that the percentages show no very consistent or illuminating differences. They indicate no type of calcified gland or glands in which one might predict the likelihood of present or future pain, nor are they helpful in explaining the manner of pain production. That pain actually is associated with their presence, we have no doubt.

One finding of interest in the review of these 123 roentgenograms was the occasional presence of calcification very low in the pelvis. Since the glands usually involved are in the mesentery, shadows may appear almost anywhere in the abdomen, or even in the upper pelvis; but in films from four children they appear at the level of the fifth sacral vertebra, and in one other child (Fig. 1), a calcified area was noted at the level of the coccyx. It is true that the technic of taking abdominal roentgenograms tends to make objects in this region appear lower than they actually are, but such very low shadows suggest a calcification of the iliac group of glands. We have no proof that such is the case in these patients. If these glands actually were involved, it must mean that in these five children, all of whom were girls, tubercle bacilli must have reached these glands from the pelvic peritoneum, uterus, or tubes.

PHYSICAL FINDINGS

An attempt has also been made, so far as the data are available, to correlate the symptoms and physical findings, particularly pain and tenderness, with the location of the glands as determined by roentgeno-

grams. Of fifty-two cases in which data as to pain were available, it was diffuse throughout the abdomen in twenty-three; it coincided with the location of the glands in sixteen; and it disagreed with the roentgenogram as to side or level in thirteen. Of thirty-one cases in which tenderness was recorded as demonstrable, the tenderness was diffuse in three, coincided with the x-ray findings in fifteen, and disagreed with the x-ray findings in thirteen. It was pointed out by Floderus[12] in 1910 and reiterated by Head[13] in 1926 that tumor is a relatively constant finding. In only four of our cases was there a palpable mass noted; in all it coincided with the roentgenologic picture. This discrepancy might be explained by the fact that all of our cases were of children in whom the process had not sufficiently advanced to cause the large masses palpated by former writers. However, in those patients whom we have followed into their late teens, we still fail to find the tumor by careful palpation, even with the help of the roentgenogram. Of the twenty-seven patients whose pain is recorded as localized, it was right-sided in eleven, but located in the right lower quadrant in only four. Pain was present on the left side in nine, and localized at the umbilicus in five.

Tenderness has often been described as a common physical finding, especially tenderness in the right lower quadrant, and it has been pointed out by several writers,[4, 11-14] that the tenderness of such glands differs from that of appendicitis in being somewhat medial to and above McBurney's point, corresponding anatomically to the position of the glands in the ileocecal mesentery. Of the thirty-one cases with recorded tenderness, fifteen were localized in the right lower quadrant, but no exact point of maximum tenderness could be made out. Also, in several of these fifteen cases, the glands were found by x-ray to be on the left side of the midline. Our findings are in agreement with those of other writers in that we are able to demonstrate no exact clinical picture for the majority of these patients.

TREATMENT

Before discussing our experiences with the management of this condition, it should be repeated that we have tried so far as possible to limit this study to children with glands which have calcified and are presumably not in an active state of tuberculous disease. It is for this reason that we have refrained from considering the symptoms and outcome in the seven children who had an associated tuberculous peritonitis. In them an active or subsiding disease process might invalidate conclusions concerning the glands themselves. That the calcification of glands may not always be a guarantee of the quiescence of the process is shown by one instance described below. However, when repeated roentgenograms have been taken during the months or years following the discovery of the first calcium in our patients, new shadows have not appeared on the plates. Thus, the symptoms would appear to be asso-

ciated usually with lesions already calcified, rather than with any associated active inflammation.

Some writers have not made this distinction clear, and a resultant confusion clouds the appraisal of measures proposed for therapy. Patients such as ours, with calcified glands have been referred to in the literature as having "surgical tuberculosis," thereby giving the impression that surgical treatment is of necessity indicated. This impression is strengthened further by repeated statements that exploration of the abdomen is always indicated when symptoms are acute. Some writers appear to advise laparotomy even in the presence of mild symptoms, defending the procedure as a diagnostic aid. We feel that this is unjustified, except in cases in which it may be thought wise to determine the presence and degree of a suspected associated active tuberculous process.

Obviously, in those cases with abdominal pain and tenderness in the proper region, appendicitis must always be considered. In some instances appendicitis has been present in a child whose flat plate showed calcified glands, or the picture may be so confusing that it cannot be clarified without laparotomy. This occurred in the only one of our patients in whom surgical exploration showed a possibly active tuberculous process associated with calcification.

CASE 4.—A. L., a boy aged five years, had had pains about the umbilicus at monthly intervals for eighteen months. There was occasional vomiting. There was no history of tuberculosis contact, but he had received raw milk during his first year. The tuberculin test was positive; no chest x-rays were taken, but those of the abdomen showed a mass of calcified glands just to the left of the midlumbar region. Examination of the abdomen was entirely negative though he had complained of pains the previous day. Two months later he was found to have some tenderness and slight spasm in the right lower quadrant. Although his pains were not increasing and his condition not acute, it was decided to remove the appendix and investigate the glands. At laparotomy a large mass of glands was found in the mesentery of the ileum, one of which was broken down and showed yellow through the thin covering over it. An attempt was made to enucleate this gland with removal of caseous material and some lime salts. The cavity was sterilized with iodine. A few adhesions which were drawing the bowel toward the mass of inflamed glands were divided. The appendix did not appear grossly pathologic to the operator but was reported by the pathologist as showing an acute appendicitis and as containing several thread worms (oxyuris). Unfortunately no pathologic study of the glandular material was made. Convalescence was uneventful. In the five years since the operation the child has been well except for very mild and transient abdominal discomfort occurring at intervals of two or three months.

Here the presence of caseation may indicate some activity of the tuberculous process. It is, of course, impossible to neglect the appendix as a cause of his symptoms, but the history of pain in the umbilical region for more than a year points to the mesenteric glandular process as a very probable background. The case illustrates that exploration

may sometimes demonstrate glandular lesions which have not yet become entirely quiescent.

Surgical manipulation of tuberculous processes not completely inactive may involve some risk to the patient. Our follow-up of children whose symptoms were treated purely expectantly indicates that this risk need seldom be taken (Chart 1). There is, however, a more definite indication for surgery in children in whom intermittent and severe abdominal pains persist or increase during years of treatment by modified rest and hygiene. When this happens, one need have little fear of encountering an active process, so that the widespread excision of as many nodes as possible may be indicated. The good results following such an operation have been stressed particularly by Auchincloss.[3] In only three of our seventy-one children with symptoms has this operation seemed advisable. These cases are abstracted below: In the first two cases (Cases 5 and 6), such an excision was performed with very definite relief; in the third (Case 7), we feel that the course of events practically demands it.

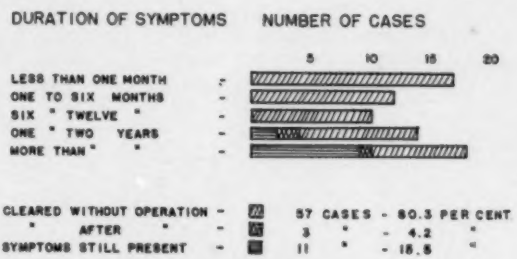
DURATION OF SYMPTOMS
NUMBER OF CASES
5
10
15
20
LESS THAN ONE MONTH
ONE TO SIX MONTHS
SIX " TWELVE "
ONE " TWO YEARS
MORE THAN " "
CLEARED WITHOUT OPERATION - 57 CASES - 80.3 PER CENT
" AFTER " - 3 " - 4.2 "
SYMPTOMS STILL PRESENT - 11 " - 15.5 "

Chart 1.—Duration and outcome of symptoms in seventy-one children with calcified abdominal glands.

CASE 5.—J. J., an eleven-year-old girl, was first admitted to the surgical service of the Children's Hospital in August, 1934, with a history of vague right lower quadrant pain of one year's duration. There had been one acute attack of pain and vomiting. Roentgenograms eight months before admission had shown several calcified mesenteric glands (Fig. 5). Because her pain had been increasing to the point of making her life miserable, operation was finally decided upon. Laparotomy with appendectomy and excision of only one node in the ileocecal mesentery was done. The patient showed recurrence of symptoms following operation even under a rest regime, and was readmitted in October, 1934, when several more nodes, lying deeper in the mesentery, two of which were calcified, were removed. At no time after the second operation did the patient complain of abdominal pain. She was discharged home on the eleventh postoperative day; roentgenograms taken one month after operation revealed no calcified glands remaining. At the present time, six months after operation, she is in good health, is gaining weight, and has no pain or discomfort.

CASE 6.—L. M., a girl of nearly nine years, was sent to the hospital from another state because of recurring abdominal pains of three and a half-years' duration. Her family and dietary histories were negative. At her first attack

of pain, an appendix, described by her home physician as "not acutely red and without definite abscess formation," had been removed. She was then five years old. Nine months later she had a few days of pain, sweating, and pallor, and attacks of this nature recurred from six to ten times yearly thereafter. Examination at admission showed only some deep tenderness in the right lower abdomen. Tuberculin was positive. There was some pus in the urine, which cleared in three days. Pyelograms showed normal kidneys and ureters but a mass of irregularly

Fig. 5.—Case 5 in text. Several calcified glands in front and to right of second and third lumbar vertebrae. Abdominal pain not relieved until all calcified nodes were surgically removed.

calcified glands in the right lower quadrant. Chest films were not taken. Because of the prolonged history without amelioration of symptoms, laparotomy was performed. Adhesions about the appendectomy stump were freed. Six irregularly calcified glands in the ileocecal mesentery were removed. Inoculation of material from these nodes into a guinea pig did not produce tuberculosis. The child has had no pain or other symptoms in the three months which have elapsed since the operation.

CASE 7.—M. P., a five-and-one-half-year-old girl, was admitted to the hospital in October, 1930, because of intermittent fever, night sweats of three months' duration, and a nonspecific skin rash. Three days before entry she had watery stools. Examination was essentially negative, and laboratory studies revealed no active tuberculosis. A tuberculin test was positive, and roentgenograms of the abdomen showed three calcified mesenteric glands (Fig. 6). She remained in the ward sixteen days, running a nearly normal course and gaining 3 pounds in weight. She was then sent to the convalescent home, where she remained under strict supervision for one month. In over four years of good home care since then, she has had attacks of fever (supposedly to 102° F.) every three or four months, lasting from one day to two weeks. She has had pains in the abdomen every four or five days during this period of years, occasionally sufficiently severe to cause her to cry out. The pains have been confined to the left upper quadrant. Examination at the present time reveals definite tenderness in the left upper quadrant. While no masses can be felt, repeated x-ray plates show the same calcified nodes coinciding exactly with the area of pain and tenderness. It is planned to advise removal of these nodes.

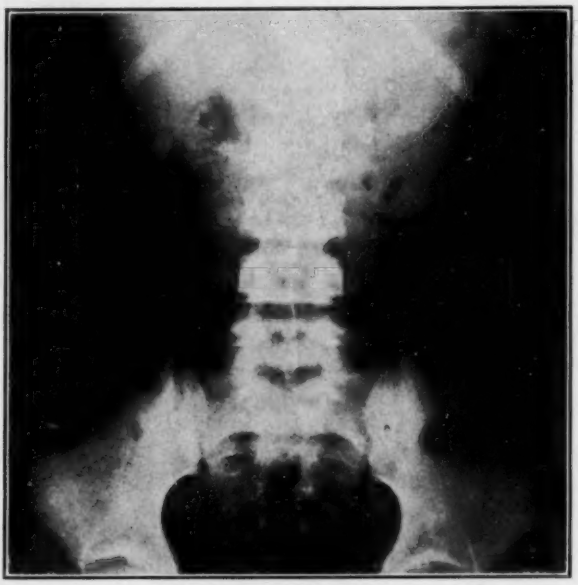

Fig. 6.—Case 7 in text. Calcified glands in the left upper abdomen of a girl aged five years. Pains increasing during four years of modified rest. Definite tenderness over glands. Surgery advised.

We wish to stress several points of importance in these two cases. First, the fact that only three patients have been considered as subjects for complete excision of calcified nodes indicates our feeling that conservative management should first be given a prolonged trial and will in the great majority of cases be successful. Second, as shown by Cases 5 and 6, complete excision of involved nodes can definitely bring rapid relief for prolonged pain from this cause. Third, as in Case 7, one

should insist on the failure of other measures before resorting to surgery. If pain and tenderness are demonstrable in the region of the glands, operation may be more strongly urged. An overemphasis upon operation for this condition has perhaps developed from the many reports in the literature in which inferences are drawn from one or two cases operated upon early, sometimes before a flat plate of the abdomen had been utilized to indicate the diagnosis. The possible complications, usually referred to in the literature, are ileus, perforation, abscess, pressure on other organs, and miliary tuberculosis. Hemorrhage and mesenteric thrombosis are also mentioned. Hydronephrosis as a rare complication has been described.[6] We have found none of these conditions. The size of our group would lead us to think that any dangerous complications, once the glands have reached the stage of calcification, are rare enough so that we feel no apprehension over a conservative policy.

No precise routine of nonsurgical management can be outlined. We have advised a good diet containing pasteurized or boiled milk and adequate vitamins, exposure to the sun, and above all, that amount of daily rest which seems to induce the cessation of pain. This may mean anything from a month or more in bed to half an hour's rest after meals. It is usually surprising what a very little rest will do for these children. Chart 1 has been constructed to demonstrate graphically the outcome of symptoms in the seventy-one children whose data are presented in Table IV. It shows that in slightly over 80 per cent of the group the complaints have cleared under such symptomatic therapy. In three patients, as mentioned above, operation has been performed with entirely satisfactory results. The remaining eleven patients (15.5 per cent of the group) report symptoms of varying severity to be still present. These symptoms are for the most part of long standing, having been present more than five years in the majority of the eleven. Without a detailed analysis of these children, it may be stated that in eight of them the attacks are mild and infrequent; in one the evidence of actual pain is uncertain and indefinite; and in only two do symptoms seem to interfere with the well-being of the patient. In the one of them who is still within the age limit of our clinic (Case 7) operation is being advised.

CONCLUSIONS

1. A study has been made of 147 children with calcified abdominal lymph nodes, seen at the Children's Hospital during the past ten years.

2. The relation of this finding to tuberculosis in general is discussed. The evidence points to the ingestion of tubercle bacilli, probably from infected milk, as being the usual cause of calcified abdominal glands. Such glands apparently are not important foci for the dissemination of tuberculosis to other parts of the body. Active pulmonary tuberculosis did not develop in the later course of any patients. Associated tuber-

culous lesions were more commonly nonpulmonary than pulmonary. Two children died of tuberculous meningitis, but this was not definitely due to dissemination from the abdominal glands.

3. About half of the total group had no symptoms referable to the glands. In the remainder the usual symptom was prolonged and recurrent abdominal pain. In a few other children there were miscellaneous symptoms unexplained except by the presence of the calcified glands. Physical examination presented no characteristic picture.

4. A review of the roentgenograms in the children with and without abdominal pain has shown no particular size, location, degree of calcification, or number of such glands, to be characteristic for the production of pain.

5. In a few female children the presence of calcified glands very low in the pelvis suggests the possibility of their infection from the pelvic peritoneum or the genital organs.

6. Treatment may be symptomatic with moderate rest and attention to diet and hygiene, or it may be surgical, either with exploration or with complete excision of the glands in cases refractory to symptomatic treatment.

7. In sixty-nine children without local symptoms no treatment was usually advocated beyond safeguarding the milk supply. The outcome in this group has been satisfactory except for the two children with meningeal involvement. Of seventy-one children with symptoms, fifty-seven (80.3 per cent) have recovered under general hygienic treatment; eleven (15.5 per cent) still have some pain; and three (4.2 per cent) have been treated surgically with relief. Surgery at present seems indicated in one other child whose pain is increasing under nonsurgical management. Surgery seems to us advisable and most successful only after the prolonged trial of general symptomatic measures.

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AN ESSAY ON THE RATTLES

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A SUDDEN attack of laryngeal obstruction accompanied by loud, harsh stridulous breathing, rapidly increasing and continued respiratory difficulty, and an anxious facial expression is, in the lay mind, one of the most alarming of childhood diseases. It almost always causes considerable apprehension and leaves an indelible impression on the parents, and even physicians, more intent upon differential diagnosis and effective treatment, are seldom able to regard it with absolute composure. In biblical times, the progressive suffocation from complete laryngeal obstruction was considered the most terrible and painful of the 903 known causes of death; and the Emperor Napoleon, although accustomed to the suffering and slaughter of wars, was so moved at the death of his nephew, his contemplated successor, that he offered a prize for the medical solution of the problem. The clinical picture of laryngeal obstruction has been repeatedly observed throughout the ages and frequent references in both lay and medical literature can be found, but there is probably no medical condition to which so many descriptive but unrelated terms have been applied. It is to this constantly changing terminology that I wish to call attention and incidentally to show that in former days a superficial resemblance of signs and symptoms caused many unrelated conditions to be considered as one disease.

About a century ago, John Redman Coxe,[1] a Philadelphia physician, searched the early medical literature to find if the ancients were familiar with the syndrome, and he thought that under the words "dyspnea" and "asthma," depending upon the degree of obstruction, he could discern some cases of the disease. Though today asthma has a very special meaning, it was not so very long ago that this word was used for laryngeal conditions. Underwood, for instance, has a chapter on the "asthma infantum spasmodicum" which was synonymous at that time with the croup or acute asthma.

One of the most popular names for a very long time was the Latin word *cynanche* (pronounced sin ann' ki) which was derived from the Greek κύων, dog, and ἄγχω, to choke or strangle. How strangling came to be associated with a dog I do not know. One writer suggests that this name was selected because dogs and wolves were supposed to suffer from the same disease, and another that the choking suggested a dog's collar, but perhaps the harsh, hollow cough that often accompanies laryngeal conditions suggested the barking of a dog. At any rate, "cynanche" was used for years and was a very old term

even in 1662 when the Connecticut General Assembly declared a day of thanksgiving for deliverance from an epidemic of *cynanche trachealis*, in this instance probably laryngeal diphtheria.

In many of the older texts it is very difficult to know whether the author is referring to diseases of the throat or to diseases of the larynx. Aretæus (third century) used κυνάγχη (cynanche) when there was inflammatory swelling and συνάγχη (synanche) when there was a narrowing or constriction of the parts, but Paulus Æginata (seventh century) used "cynanche" for inflammations of the trachea and "synanche" for inflammations of the throat. Others used the words interchangeably, and as a result of the confusion we find the word "squinancy." There is a black letter work by John Vigo, for instance, printed in 1586, with a chapter, "Of an Apostume of the Throte called Squinantia." In place of "squinancy" we sometimes find the contracted forms "squinacy," "squinsey," and "quinsey." Although nowadays "quinsy" is used solely for peritonsillar abscess, for a long time it meant laryngeal obstruction. Here is a quotation from Thomas Phayre (1544) on "this outragious sickenes":

OF QUINSEYE AND SWELLING OF THE THROTE

The quinsy is a daugerous sicknes both in young & olde, called in latin angina,* it is an inflammacion of the necke with swellyng and greate peyne, sometime it lyeth in the verye throte, upon the wesaunt† pype, and then it is exceeding perillous for it stoppeth the breath, & stranguleth the pacient anone.

Other whyles it breaketh out like a bonche on the syde of the necke, and than also with verye great dyffycultye of breathynge, but it choketh not so sone as the fyrst doeth, and it is more obediente to receive curacion.

The signes are apparaunt to syghte, & besides that the chylde can not crye, neyther swallow downe his meat and drynke without payne.

Although the old New England quinsey of the seventeenth century may have been any laryngeal or pharyngeal condition, there can be no doubt about the quinsy of 1740, as described by the Rev. Jonathan Dickinson, founder of the College of New Jersey (Princeton) and, by the way, an excellent physician:

This Disease appears sometimes in the Form of a Quinsey. The lungs are inflamed, the Throat and especially the Epiglottis exceedingly tumefied. In a few Hours the Sick is brought to the Height of an Orthopnoea; and cannot breathe but in an erect Posture, and then with great Difficulty and Noise. This may be distinguished from an Angina by the Crustula in the Throat, which determines it to be

*Angina, like quinsy, in the old days, was applied more to laryngeal than to pharyngeal conditions, although the opposite holds true today. According to Skeat's *Etymological Dictionary*, both words have the root "AGH" or its nasalized form "ANGH," to choke, strangle, compress, afflict, frighten. Cf. ἄγχειν, to choke; Latin, *angere*, to choke; Sanskrit, *amhas*, pain. The words *anger, anguish, anxious, angina, quinsy, ail, awe,* and *ugly* have this common root.

†Wesaunt, weasand, etc. Literally "the wheezing thing." The word generally stood for trachea but was also frequently used for larynx, pharynx, or esophagus. "But monie daily weet their weason wi' liquors nice,"—Robert Burns (1785). Our slang "wet your whistle" may possibly have a venerable ancestry.

a Sprout from the same Root with the Symptoms described above. In this Case the Patient sometimes dies in twenty-four hours. I have not seen any one survive the third day.

Laryngeal diphtheria is sometimes very difficult to distinguish from acute catarrhal laryngitis, and the early writers undoubtedly thought that they were different degrees of the same disease because the same or similar terms were often used to describe them both. In the following anecdote,[2] the repeated attacks, each followed by recovery, make catarrhal laryngitis the most likely diagnosis:

Aug^{t} 11th or thereabouts, 1730. My Eldest son, Samuel, swallow'd a Brass Pin, reather better y^{n} an Inch & half long, w^{ch} came thro' Him in ab^{t} 44 Hours—a wonderfull salvation, may G^{d} have y^{e} glory of it, & if my Child lives to take Notice of this Record, be Quickened y^{r}by to Devote himself to G^{d} who wonderfully appear'd for Him in y^{e} Deliverance, as well as many times heretofore w^{n} He has been brought very low with y^{e} Squinancy.

"Canker" was occasionally used for laryngeal obstruction as in John Walton's account below, but generally it meant the same as our exudate or membrane in the throat. It (cancer and chancre also) came from the Latin *cancer,* crab, and one has a choice of many explanations. In discussing cancer, Paulus Æginata said, "The veins are filled and stretched like the feet of the animal called cancer, and hence the disease has got its appellation. But some say that it is so called because it adheres to any part which it seizes upon in an obstinate manner like the crab." In his chapter "Of a Canker in the Mouthe," Thomas Phayre wrote: "It is so named by reason of crepynge and eatynge forwarde and backewarde, and spreadeth it selfe abrode, lyke the feete of a creues, called in latine cancer, notwithstanding I knowe that the Greekes, and auncient latynes, gyve other names unto thys dysease, as in callynge it an ulcer, other whyles aphthe, nome, carcinomata, and lyke, which are al in englyshe, knowen by the name of canker in the mouth. . . ."

There was a time, particularly in eighteenth-century America, when epidemics of diphtheria and scarlet fever frequently occurred together, and for many years the two diseases were hopelessly confused because it was believed that both diseases were caused by the same "morbifick matter" in the blood and had different appearances depending upon whether this "morbifick matter" settled on the skin or in the throat. At that time, "canker" was diphtheria and "canker rash" was scarlet fever but during the epidemics many laryngeal cases were seen and then we find the condition described as "canker quinsey." This is said to have caused the deaths of the eight children of Mark How, of Ipswich, all of whom died between Nov. 5 and Nov. 28, 1735. A similar diagnosis is found in the Wintonbury (Bloomfield) church records:

Pamela, child of Russel Manley. Jan^{r} 28th [1800], aged 2½ years. Horse canker.

(In other words, hoarseness, indicating laryngeal involvement, superimposed upon an ulcerated throat.)

Perhaps the quaintest and most descriptive of the purely American terms was "bladders in the windpipe." If "bladders" was used to mean something that could be quickly distended by air or water, perhaps, after all, the analogy was not far-fetched when we recall the edema that often accompanies inflammation. It is doubtful if the old Puritan doctors had any such thoughts in mind, nevertheless the phrase was frequently used for laryngeal obstruction, in the following quotation[3] again for the diphtheritic kind:

> In December, 1659, the (until then unknown) Malady of *Bladders in the Windpipe,* invaded and removed many Children; by Opening of one of them the Malady and Remedy (too late for many) were discovered. Among those that thereby expired, were the Three Children of the Reverend Mr. Samuel Danforth. . .

Closely akin was the descriptive "rattles in the throat," and among the deaths in the West Hartford church records there is reported:

> Jan^{y} 29th 1765. Abraham (son of Abra^{hm}) Sedgwick. Obstruction of the Lungs vulg. dict. Rattles. 6 yrs.-8 mos.

Of some interest in connection with the word "rattles" is an early American medical work published in Boston in 1732 and to which very little attention has been paid, and rightly so, for it contains very little of scientific interest and certainly no notable descriptions. Perhaps its rareness may be the reason for its neglect. It is worthy of some attention, however, chiefly because of its quaint pathologic descriptions, its presumptive evidence that diphtheria was common in New England, and because it is probably the first medical work by a graduate of Yale. But first a word about the author.

John Walton (1694-1764), a native of Preston, Conn., was graduated from Yale in 1720, where he had been an industrious student with a bent for serious poetry. He became a Presbyterian minister and preached at Crosswicks, Allentown, and Cranberry, in New Jersey where "his preaching was admired. People heard him with many tears." But evidently his religious principles had little influence on his own way of life, and in the spring of 1722 he was suspended by the Presbytery of Maidenhead "for his lustful carriage to some young women." Walton continued to preach, however, and was formally suspended a second time but he appealed to the Synod, and it was agreed that he could continue preaching provided he would confess. The confession was such that the other ministers who heard it "were surprised." On account of "further contemptuous behaviour" he was suspended for good in October, 1723.

He is then thought to have opened a private school in New York City where he advertised for pupils in Hebrew, Latin, and Greek; but the desire to be a minister again overtook him, and he next appears in

charge of the Presbyterian churches in White Plains and Rye, New York. Eloquent and persuasive, he was able to stir up considerable religious strife, and about this time (1728) the rector of the neighboring Episcopal church complained that "this Walton, being a bold, noisy fellow, of a voluble tongue, drew the greatest part of the town after him," and the Congregational ministers warned all others to beware. Yale College twice refused him the degree of Master of Arts.

When we next hear of Walton he is a farmer as well as a minister, preaching and writing in defense of the Baptist faith and soon thereafter he was recommended by the Governor of Rhode Island to be the minister of the First Baptist Church in Providence. Not receiving the appointment, he gave up the ministry and went into law and politics. In October, 1733, he was admitted a freeman of the colony and in 1743 represented Glocester in the General Assembly. The last we read, he is an Associate Justice of the Rhode Island Supreme Court.

In those days it was not unusual for ministers to heal the bodies as well as save the souls, and it is said that Walton practiced medicine while living in the vicinity of Providence. It was during this brief interlude in his varied career that, I presume, he wrote "A Short Essay on Rattles and Canker," which, although it has a separate title page, was printed and bound as a part of *An Essay on Fevers, the Rattles, & Canker.* The paragraph concerning the pathology of respiratory obstruction is quaint enough:

If we consider the Frame of our Bodies, w^ shall find they consist of Solids and Fluids; and when any of these are raised above or depressed beneath the Ballance of Nature, that then Health will be annoy'd, and various uneasy Symptoms ensue. So in the Case now to be explained, we may justly conclude, that there are some disagreeable Particles that affect the Lungs and Throat, and hinder the regular Circulation of the Fluids, and destroy the Solids; and that these proceed from an Error in some of the Non-naturals, especially the *Air,* which (as the excellent *Sydenham* has prov'd) contains the Seeds of the most Epidemical Diseases. Now whilst the Air or Breath passes into the minute Branches of the Wind-pipe, and as the Blood circulates through the Lungs, in Channels that accompany the Tubuli of the Trachea, if either or both of these contain heterogenous Particles that stick in the Lungs, especially if they fill up the small Branches of the Wind pipe, the Air will soon be obstructed from impregnating the Blood with those Particles that give it a *Momentum,* and keep it from cohering in too bulky Globules; upon which there will ensue Obstructions of the Circulation of the Blood in the Capillary Branches of the Pulmonary Artery and Vein, and the Breath be gradually excluded from entring the Lungs, which must necessarily occasion a Difficulty of breathing, an Inflammation and Fever, and sometimes erosions of the Solids. And according as the Morbifick Particles are shaped, and the place they settle on, so we distinguish the Distemper. If they are very sharp pointed and large, so as to corrode the Solids when crouded against them by the Air on one side in the Trachea, or by the Blood on the other side, or otherways, then we call it the *Canker;* but if they are Sphæroidal, Conical or Cubical, &c. we distinguish them according to their Figures, Cohesions, Bulks, Motions, and Effects consequent thereupon: So if a load of these lie long upon the Lungs, there will be a *Consumption,* and Ulcers

breed accordingly, and a *Hectick* ensue. And in case the Obstruction be sudden, great, and principally in the fine Branches of the Wind pipe, and the Particles not much pointed, but cohere so as to constitute what we call *Tough Phlegm*, then 'tis that which we call the *Rattles*, or *Quinsey* in the Lungs, especially in Children; and is distinguished according to the Nature and Quantity of the Phlegm, and the Noise the Air makes when it endeavors to inflate the Lungs, and the Difficulty in Breathing. But in case the Obstructions seize the Lungs near the Mouth, 'tis called a *Quinsey*. Here it must be observed, that these Obstructions are extensive; for as the Blood swiftly circulates through all parts of the Body, it absorbs some of the Morbifick Particles, and conveys them to different parts of the Body, and dischargeth them in every convenient place, especially where the Glands are most open: Hence the Salival Glands are so often affected, especially with the *Cankery Particles*, and *Scurvy Scropholous Tumours*.

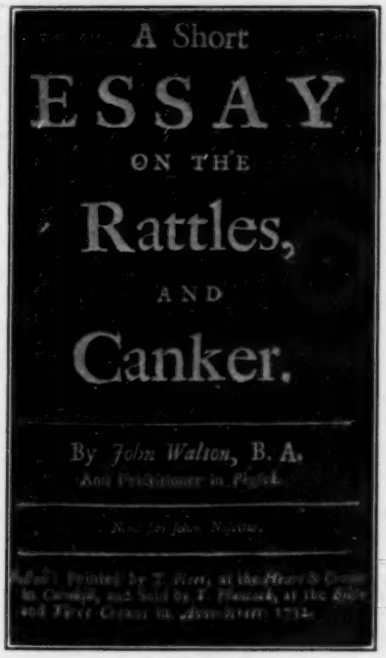
A Short
ESSAY
ON THE
Rattles,
AND
Canker.
By John Walton, B. A.

Fig. 1.

If John Walton had followed Sydenham's teachings more carefully and recorded simple facts instead of the iatromathematical theories of an earlier day his essay might have been more important and he would not have been so far behind the times. As an example of what he might have done, there are extracts from the diary of Samuel Sewall, Jr.,[4] written at nearly the same time and containing a few simple bedside observations. Although unrecognized, it is probably the first written account, in America at least, of what used to be a very common disorder. The patient, John Sewall, was the great-

grandson of John Hull, the mintmaster, of Pine Tree Shilling fame and the grandson of Chief Justice Samuel Sewall, the noted diarist. John Sewall was the sixth child and about nine months old when his troubles began:

1724. Jan 3. In the Night son John have two short fitts. 4th. Wife goe to see him. . . . 12th. In the Night son John have a fit. 14th. Towards morning he has another short fit. 15th. Send Mathew for son John. His Nurse Sarein comes with him. Next day goe home. Her sister Lydia comes to assist in weaning him. . . . Feb. 2. Son John have a short Fit. . . . 17th. Son John, about six a clock, have a convulsive fitt. Held him rather better than a qu. of an hour. . . . March 10. Something before day, son John have a fit & by 7 morn, have six. Noon, one a longer & stronger. Send for Dr. Tompson. Mathew see him by Sharps & he came. Look'd upon the Child & saies he has a bladder in his throat. . . . April 20th, very hot. Carry John with Nuss Lee to Widow Ruggles (alias Fiedler) for Her to keep him. . . . Aug. 18th. Mrs. Ruggles send her Daughter to acquaint us that son John had a Flux & vomited. As we went to Boston called & see it, it being considerably ill. As we goe to Boston call at Dr. Tompsons. He gone to Boston. Call as we come Back & take him with us. We thought he was better, and so went home.

By a "bladder in his throat," Dr. Tompson undoubtedly meant a laryngeal obstruction and so we have an explanation of young Johnny Sewall's complaints. His age, the season, repeated convulsions, laryngeal "crow" and ultimate recovery give us a diagnosis of tetany, or for those who prefer what has been called "the somewhat pedantic and cacophonous title—Laryngismus Stridulus."

The *serunke* or *askara* of the Talmud, the *garrotillo* of seventeenth-century Spain, *paedanchone* (child-throttling), and *morbus strangulatorius* were sometimes used, but there still remain a few other terms about which I would like to say a word. In early English medical literature many diseases characterized by difficult breathing were called "*the rising of the lights,*" the "lights," or lungs, being distinguished from the other organs by their weight. Later, especially in the north of England, laryngeal obstruction was commonly called "chock" and "stuffing," the reason not difficult to imagine, but why it was called "the great hives" in Ireland and Scotland is beyond my ken. In colonial Pennsylvania and New Jersey, it was also called the "hives,"* which, according to Benjamin Rush, "appears to be a corruption of the word 'heaves,' which took its rise from the manner in which the lungs *heave* in respiration. The worst degrees of the disorder are called 'the bowel hives,' from the great motion of the abdominal muscles in respiration." There seems to be some discrepancy here, for "bowel hives," as distinguished from "chest hives," was also used to describe intestinal disorders, rickets, skin diseases, and various other things (Still).

*Morristown, N. J., Bills of Mortality: April 24, 1774. Nathan, son of Peter Norris, jun, aet. 2, Hives.

The word "croup," the most popular name today and the one which seems likely to survive, goes back to the Anglo-Saxon but came to us as a medical term from Scotland, where it was applied to various forms of laryngitis supposedly because of a similar disease—the croup or pip—of poultry. It was introduced into medical literature by Patrick Blair in 1718:

> The *Tussis Convulsiva* or *Chink-cough*, is also some Years Epidemical, and becomes universal among Children; as is a certain Distemper with us, called the Croops, with this variety, that whereas the *Chink-cough* encreases gradually, is of a long continuance, seizes in Faroxysmes, and the Patient is well in the Interval. This Convulsion of the Larinx as it begins so it continues, so violently, that unless the Child be relieved in a few Hours, 'tis carried off within twenty four, or at most forty eight Hours. When they are seized, they have a terrible Snorting at the Nose, and squeeking in the Throat, without the least Minute of free Breathing, and that all of a sudden, when perhaps the Child was but a little time before healthful and well.

Francis Home, another Scotch physician, wrote a pamphlet on the disease (1765) and I can think of nothing more appropriate to bring this discussion to a close than some comments on Home's work which were written by Dr. Buchan, a well-known eighteenth-century pediatrician. He writes from Sheffield, England, to his friend William Smellie, a printer in Edinburgh:

> I cannot make out from your account whether Dr. Humes pamphlet on the Croup is wrote in Latin or English. If in the former, I think *Suffocatio Stridula* a very proper name; but if he translates that into *Croup*, he may keep his pamphlet at home; for I have never met with any man in England, either medical people or others, who called the disease by that name. Though that disorder is very common here, yet should one speak of the croup to a Yorkshire man, he would believe you either meant the rump of a fowl, or the buttocks of a horse. The disease, however, is by no means sufficiently understood; and I should be extremely glad to be possessed of any good performance on the subject. Betwixt you and I, it does not matter a pin what name any man gives a disorder, provided he points out the symptoms accurately, and proposes a rational method of cure.

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Critical Review

THERAPEUTIC USE OF DIETS

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THE custom of the past in prescribing diets for those who were ill was to specify the exclusion of certain types of foods which were considered undesirable because of the nature of the patient's illness.[1] A more positive approach to the problem is to prescribe certain specified foods which are needed by the body for the maintenance of normal nutrition in health or in illness, then to adapt the nature of the prescribed foodstuffs to meet the requirements peculiar to the patient's condition. The growing recognition[2] of disease states brought about by deficiency of the diet in certain essentials for normal nutrition has led to the adoption of this second approach to diet control as being much safer for the patient and much more effective therapeutically. Evidence is rapidly accumulating to show that attention should be paid to the completeness of the diet of the individual who is not ill so that disease may be avoided and that optimum levels of health may be approached. The needs of the patient with any type of illness are qualitatively similar to those during health, and equal attention should be directed toward meeting them. The weakness, anorexia, or incapacity of the patient makes it imperative that the attendants maintain the initiative in supplying food of a thoroughly suitable nature for the patient. The first consideration in designing a dietary program for a patient with any type of illness should be the completeness of the diet in all recognized essentials of nutrition, with liberal rather than minimal amounts of the protective dietary substances. The nature and amount of the foodstuffs may be determined to meet the peculiar conditions imposed by the nature and degree of the patient's illness, but valueless restrictions should not be imposed. In other words, the diet prescription should be one of inclusion rather than exclusion, restrictions always being accompanied by advice as to the inclusion in the diet of substitutes which nutritionally are equivalent to the prohibited foods. Unless such a policy is pursued, a prescribed diet of limitation may be a source of danger and of damage rather than of benefit[3] to the patient, and the induced disturbance of nutrition may more than offset the therapeutic value of the restriction. In all instances, the patient rather than his disease should be treated.

For convenience in discussion, therapeutic dietetics may be considered under the following categories:

1. Diet in acute or chronic illness in which the nature of the disease does not of itself predicate the types of foods which may be used.
2. Diet in conditions in which the patient's ability to digest or assimilate foodstuffs is impaired.

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3. Diets for those with allergic states.
4. Diets designed to correct specific or nonspecific deficiency states.
5. Diets designed to alter the acid-base balance of the tissues.
6. Diets for the control of diabetes mellitus and other disturbances of metabolism.
7. Diets designed to conserve the excretory functions.

Preliminary to the discussion of types of diet management best adapted to each of the above conditions, it is well to review the characteristics of a desirable diet for the healthy individual since the therapeutic diet will be based on a similar regimen so far as possible. Clinical and metabolic studies have indicated that diets of a high protective content offer the individual definite advantages over the type of diets customarily offered in homes and commercial eating establishments. As a guide in designing the diet of a healthy child of school age, the following ingredients have been specified[4] as a desirable basic daily intake, these foods to be supplemented but not replaced by foodstuffs which may have a lower protective power, but which offer attractive or economically desirable sources of energy:

1 quart of milk
1 or 2 eggs
1 ounce of butter
1 teaspoonful cod liver oil
I orange, or tomato, or apple
1 additional serving of fruit
2 servings of vegetables, one of a fibrous nature
1 serving of meat, fowl, fish, or liver

While some of the essentials of the diet may be supplied equally well in the form of other foods, those listed are of a type readily available and of proved efficacy. Omissions are not to be made, unless the omitted foodstuff is replaced by another of comparable protective efficacy. In designing therapeutic diets, this list may be used as a guide, altering through suitable substitution in such a manner as the patient's age, physical condition, or disease may require. As an aid in making such an adaptation, it is well to consider each of the foods listed as to the reason for its inclusion in the list of requisites and as to the nature of permissible substitutions.[5]

Milk is the only practical food source of calcium. The normal child needs 1½ pints of milk daily in order to meet adequately the calcium demands of his growing body. Equal amounts of skimmed milk or of buttermilk will supply similar amounts of calcium, as will 4 ounces of cheese. Oranges stand next in practicability as a source of calcium, but in this regard ten average sized oranges will be required as a substitute for a pint and a half of milk. The calcium content of other natural food products need not be ignored, but its concentration is so low that they do not represent suitable sources of importance. Calcium salts may be employed when milk cannot be taken in sufficient amounts; their utilization is less certain than that in milk, especially during illness and in the young child. Dicalcium phosphate seems to offer advantages over other calcium salts, particularly those which do not contain phosphate. A suitable daily dosage to meet the entire calcium requirement is 90 grains, or 6 grams. Because of its bulk, this is best incorporated in some semisolid food.

Milk is an important source of protein and when taken in the amount indicated will supply a good share of the body's needs in a desirable form. Suitable substitutes for this protein can be obtained from other sources of animal protein, such as meat products, in amounts greater than would be needed if milk were included in the diet. In the discussion of allergy, other milk substitutes will be named.

The vitamin B and G content of milk is noteworthy when the prescribed amount is ingested. When necessary to eliminate milk from the diet, increased servings of vegetables and of meat, especially liver, will help to complete the requirements for these vitamins. Foods made from seeds, such as whole grain products, peas and beans, also are valuable sources of vitamin B. The root vegetables are preferred to the leafy types as sources of vitamin G. Many of the so-called concentrates of these two vitamins are not appreciably richer in their content than are some of the common foods. Crystalline vitamin B has been produced and when commercially available may find a place of value in supplying that principle to those whose assimilative ability is so lowered that ordinary foodstuffs cannot be employed for the purpose.[6]

While whole milk, cream, and butter may constitute valuable sources of vitamin A, this property need not be stressed if the child is receiving cod liver oil in the amounts prescribed. Liberal servings of the pigmented vegetables also will forestall deficiency of vitamin A, if ingested and well utilized. Concentrates of vitamin A are available in the form of pro-vitamin carotene or the oil of halibut liver, and these may be employed if necessary to insure completeness of supply.

Cod liver oil offers a recognizedly adequate source of vitamin D; without the continuous use of it or of some equally potent source of the vitamin, there is the utmost likelihood of deficiency of vitamin D except in the individuals receiving considerable solar or other ultraviolet irradiation; the lack of clinical evidence of that deficiency does not negate its existence or its significance in the maintenance of the general level of health. With suitable amounts of vitamin D, as viosterol or as certain suitable concentrates of cod liver oil, the vitamin D requirement may be met as well as with cod liver oil. Unless properly fortified, however, these products may fail to insure adequacy of vitamin A intake. Moreover, they fail to supply significant amounts of iodine and of valuable fatty acids as contained in cod liver oil.

Fruits and vegetables supplement the mineral intake, provide bulk necessary for the regulation of intestinal elimination, and constitute important sources of vitamins A, B, C, and G. Because of the instability of vitamin C, it is well to include one raw vegetable or fruit in each day's food allowance; although orange or tomato is popularly specified for this purpose, most raw fruits or vegetables offer vitamin C in amounts sufficient for the body's needs, if suitable quantities are ingested. Acid fruits such as tomatoes retain much of the vitamin even after cooking. When therapeutic conditions make it necessary, vitamin C may be supplied as cevitamic acid.[7] When roughage is contraindicated, juices from vegetables and fruits may be employed. A wide variety of fruits and vegetables usually is desirable, with emphasis being placed on the succulent types rather than those which are essentially of a starchy or seedy nature.

Eggs offer a desirable type of protein, together with other organic and inorganic substances of value to the rapidly growing animal organism. They do not seem to be essential foodstuffs but are valuable in their content of protective substances. Meat products and milk can be used to replace the protein they would supply; if cod liver oil is being taken as prescribed, the vitamin content of the egg will not be needed. With a liberal intake of iron-containing foods, such as liver and other meat products, leafy vegetables, or inorganic iron preparations, egg will not be needed for that purpose. The chief defense for including egg in the list of foods ordinarily prescribed lies in the fact that it is the foodstuff designed by Nature for the rapidly growing chicken from the earliest embryonic stage; it obviously is rich in the principles necessary for tissue growth, and possibly it furnishes important substances of a nature not yet recognized.

Meats are specified because of their content of proteins which are similar in their nature to those of the human body. During infancy the protein need can be met by sufficient amounts of milk, but thereafter the inclusion of meat is desirable. Meat also is a valuable source of iron and of vitamins B and G; the iron, however, is less available for human use than that from nonanimal sources.[8] Liver is superior to lean meat in several respects and can be used advantageously at least once or twice weekly. Gelatin is not a satisfactory source of tissue-building protein; proteins from vegetable sources are less valuable for the body than those of animal origin.

DIET SUPERVISION DURING ILLNESS

The nutritive requirements of the body are not lessened by illness; on the contrary, certain food requirements are definitely increased when an individual is ill. The patient's nutritional state at the onset of illness will determine the urgency of his nutritional needs during a brief illness; if proper attention has been paid to his diet, a fair store of vitamins, minerals and possibly of protein will serve to tide him over a period of a few days of reduced intake. However, it is not safe to depend on such a margin of safety; it can be depleted rapidly, and insufficient food ingestion may precipitate the child into a condition much more serious than the original illness.

During *acute illness*, particular attention must be directed to the intake of a readily absorbed and utilized source of energy, together with fluids in amounts sufficient to replace those lost through excretion. If this is not assured, the development of ketosis and dehydration may be expected, either of which in itself may lead to an unfavorable outcome. Fever increases the caloric needs of the body by about 10 per cent for each degree of elevation of temperature. Even in chronic conditions which are not associated with marked elevations of temperature, the energy requirements are considerably higher than would be expected for a child confined to his bed.[9] Fuel consumption will not be lessened if food is not ingested; the body's stored foodstuffs or its own tissues will be sacrificed for the purpose. If the patient's condition permits, a diet composed of milk (skimmed, if whole milk is not tolerated), fruit juices reinforced with dextrose, and simple ices will do much to maintain adequate nutrition and to combat the illness. Milk soups may form vehicles for puréed vegetables. Concentrated forms of vitamins A and D may be used at such times with value since

the reduced intake of fat may offer less hazard to gastrointestinal upsets. Foods should be chosen with a view to their value to the child, the completeness of the combination offered, their readiness of ingestion and digestibility, and their palatability and attractiveness. While the child's distaste for food may tax the ingenuity of attendants to the utmost, the problem is not met by offering foods merely because they will be eaten; the diet should meet the nutritional needs as completely as the situation will permit. It is unnecessary for a patient to lose a considerable amount of weight during a short illness if his attendants are actively concerned with the amounts and nature of the food he receives.

When the nature of the illness or the patient's inability to eat makes it necessary, it is obligatory that nutrient fluids be given parenterally. Ringer's solution is a vehicle of choice since it supplies not only fluid, but also the mineral constituents needed by the body. It can be given by any parenteral route as an isotonic solution; aqueous solutions of dextrose up to a 6 per cent concentration may be added if it is to be given subcutaneously, or in greater concentration if given intravenously. In some situations an aqueous isotonic solution of dextrose (6 per cent) may be fed by gavage to great advantage. When hypertonic solutions are given, they will dilute themselves by imbibition from available body fluids before they are absorbed; for this reason the use of hypertonic solutions of dextrose by gavage, or subcutaneously, is contraindicated. The rate of continuous administration of fluids intravenously should be within the limits of handling by the circulatory system; 3 c.c. per kilogram of body weight per hour is the rate suggested by Marriott, Hartmann, and Senn.[10]

Diarrhea introduces a serious hazard in the management of acute or chronic illness; it may result in dehydration and may greatly reduce the absorption of ingested foods. Before considering the dietary factors in the management of diarrhea, it is important to emphasize that diarrhea usually must be considered only as a symptom, and may be caused by widely divergent conditions. During acute infectious diseases of any type, the motility of the gastrointestinal tract may be disturbed in such a manner that nausea, vomiting, and diarrhea result. The gastrointestinal symptoms in such patients are not dependent on the diet previously ingested, nor on infection within the digestive canal. Proper therapy will start with a search for the nature and source of the parenteral infection. In the infant and young child this will be found in the upper respiratory tract, throat, or ears in the great majority of instances. When such infection has subsided, either spontaneously or as the result of local treatment, the digestive disturbances will disappear. The dietary management of such patients will not differ from that described in the foregoing. In the case of the infant, acidified feedings may be tolerated better than milk dilutions, and dextrose may be substituted for other forms of carbohydrate with advantage.[11] It may be desirable to skim the milk more or less completely or to employ a dilution of evaporated milk. Food refusal, vomiting, and diarrhea frequently result in severe dehydration in infants with severe parenteral infection; to prevent a fatal outcome the use of fluids by some parenteral route frequently is imperative. Marriott and his associates[10] advise that in severe diarrhea of any causation the following procedures be employed: restrict all food by mouth;

give by vein an isotonic solution of sodium lactate (Hartmann's solution), reinforced by Ringer's solution and dextrose; slow continuous intravenous administration is preferable, but if the concentrations described above are used, the subcutaneous route may be employed. Transfusions should be used to supplement this form of treatment. When the acute diarrhea has been checked and tissue turgor has been restored, a dietary regimen may be instituted. Milk products, fruit juices and vegetable purées, and an easily assimilable source of vitamins A and D may be used initially, coarser and less easily digestible foods being restored to the diet as convalescence progresses. In diarrheas dependent on bacillary enteritis, as in typhoid fever or bacillary dysentery, the diarrhea is largely independent of the type of diet; adequacy of intake must be maintained in spite of the diarrhea. Readily absorbable foods of low roughage content are called for, well fortified with dextrose or other simple sugar. Because of impaired absorption and the increased energy requirement imposed by the disease, a high calorie intake is demanded. In severe fulminating diarrhea associated with bacillary dysentery, the chief need is for fluids; these patients often die from dehydration, and in spite of vigorous parenteral administration, fluid needs may not be met in sufficient degree to prevent death. Continuous intravenous administration of 5 per cent dextrose solution in Ringer's solution is called for, injected at a rate of 3 to 5 c.c. per minute.

In the treatment of diarrhea in childhood, the use of an apple diet has been popularized during the past few years. In the presence of considerable dehydration, that condition should receive first consideration in the manner outlined previously. In the absence of toxic symptoms, the enteral condition may be treated by feeding nothing other than scraped raw apple, using fruit which is completely ripe and mellow. One to four tablespoonfuls are given every hour or two for a period of forty-eight hours. Aside from water, nothing else is offered by mouth. At the conclusion of the period, the patient is placed on a routine of three meals daily, these consisting of farina, toast, and cocoa made with water, soup with rice, scraped beef with toast, cottage cheese, and ripe banana. After another forty-eight hours has elapsed, boiled milk may be added, then vegetable purée and finally fruit in small amounts. Birnberg,[12] in describing this regimen, states that it should not be used for young infants. Minor variants of this procedure are described by various authors. Possibly substances other than apple would be equally effective; Grodecki[13] reports that he has used raw ripe tomato for the treatment of diarrhea for thirty-five years, attributing its beneficial effect to its content of vitamins and acids. Fasold has substituted suspensions of cellulose for scraped apple and has obtained satisfactory results; he feels that the action of apple is mechanical and adsorptive. The reviewer has had no experience with the apple cure and does not feel qualified to comment critically concerning it.

Chronic colitis has been attributed by numerous authorities to deficiency of diet.[14] In chronic diarrhea of any origin, impaired absorption predisposes to the development of dietary deficiency. Because of these two interrelated facts, much attention must be devoted to the diet of the patient with chronic diarrhea. The nature of the food residue must be such that it will not lead to additional irritation of

the intestinal mucosa; nutritional essentials of all types must be included in the dietary; and because of the likelihood of wastage through imperfect absorption, the intake of the protective substances must be greater than would be necessary if the intestinal function were normal. Such patients should receive, then, a low residue diet rich in all recognized vitamins and essential minerals, with a liberal protein allowance. The preponderant use of milk and other dairy products, vegetable purées, ripe mellow fruits, fruit juices, meat, liver, eggs, cod liver oil, simple sugars, and limited amounts of thoroughly cooked cereal products should meet the nutritional needs of the patient in a manner compatible with his intestinal condition. In allergic colitis, food sensitivity must be properly treated. Equal attention must be directed to the correction of anemia through transfusions, and possibly the use of vaccines in bacterial forms of the disease. In childhood, such a regimen has led to apparent cure even in proved cases of severe ulcerative colitis.

As a cause or a sequel of chronic inanition, patients may present evidence of inability to absorb ingested foodstuffs in any degree comparable to the normal state. Such a condition sometimes is seen following prolonged misfeeding with foods which are not adapted to the individual's digestive capacity, or following severe debilitating illness. In other patients, the intestinal dysfunction has developed insidiously, without apparent etiology. *Chronic intestinal indigestion* may vary markedly in degree, and to some extent as to the type of impairment of absorption. Usually these patients fail to absorb fats and complex carbohydrates efficiently, as in so-called *celiac disease;* sometimes the absorption of fat is less affected than that of starches. The retardation of growth, protuberant abdomen, extreme emaciation, precocious and extreme tooth decay, and the frequent development of rickets and scurvy which these patients manifest offer evidence of the severe nutritional problem that they present. When the usual diet is ingested by such a child, voluminous stools are passed, and marked loss of weight may occur within a few hours. Many clinicians feel satisfied if through their dietary corrections they are able to keep such a child alive and avoid loss of weight, even though normal growth progress is not attained. Yet, through suitable dietary measures, such children have been observed to assimilate an adequate diet, and to resume normal rates of growth.

All patients with absorptive difficulties will utilize protein foods, as a class, better than either fats or carbohydrates. This fact is the basis for the three-phase high protein diet as recommended by Howland, Sauer, Parsons,[15] and others in the dietary management of celiac disease. Sauer states that such dietary treatment has led to rapid and permanent improvement in the majority of twenty-five patients with celiac disease during a period of seven years. The first stage in the diet used by him consisted exclusively of powdered protein milk dissolved in Ringer's solution and given in increasing strength and amount; when the patient's feces gave evidence of good utilization of this food, it was supplemented by the addition of other foods predominantly of protein nature, such as meat serum or scraped lean meat, egg white, or cottage cheese. Powdered skimmed milk may be substituted for the protein milk as food tolerance permits. Under this regimen the body weight should increase, and abdominal disten-

tion should subside. Cod liver oil, orange juice, and iron should also be added to the diet by installments. This phase of the diet control may require continuance for months or years before the patient's food tolerance finally will permit the adoption of the third and most difficult phase of the diet—the introduction of complex carbohydrates in the form of thoroughly cooked starches, and other foods not difficult of digestion. Sauer warns against the introduction of bread, potato, sugar, ice cream, candy, cake, and fresh milk until late in the course of treatment; with recurrence of symptoms, the earlier form of the diet should be resumed. The disease is not cured by this or by the procedures to be described subsequently; dietary control of celiac disease is directed toward the maintenance of nutrition until the lapse of months or years leads to the gradual acquisition of normal digestive tolerance.

While clinical experience has shown that patients with celiac disease can usually tolerate well diets consisting almost exclusively of protein, as described in the foregoing, evidence as to normality of growth and development under such a regimen is not convincing, nor has the necessity for such rigorous limitation been demonstrated. Haas[16] reported the successful maintenance treatment of young children with celiac disease by the use of large amounts of ripe banana; his observations were confirmed by others. The impression was gained that the banana possesses unique properties which account for its tolerance by children with impaired absorptive capacity. Nelson,[17] however, has reported the progress of children with celiac disease under a plan of diet control which provided a liberal allowance of protein in the form of boiled skimmed milk, cottage cheese, egg white, and sieved liver, but which supplied the majority of the calories, as dextrose, orange juice, and tomato juice in large amounts, leading to rapid and permanent gain in weight and subsequently in height. Cod liver oil (1 dram) was given daily. Bananas were used as an acceptable alternative for other types of simple sugars; the sugar of the thoroughly ripe banana is invert sugar, which apparently is well utilized and readily absorbed, whereas more complex sugars may remain in the bowel and undergo fermentation. Metabolic studies indicated excellent retentions of nitrogen, calcium, and phosphorus, and successive clinical studies pointed to good utilization of all the foods mentioned as indicated by the character of the stools and the physical progress of the children. As in all forms of diet therapy in this disease, rigid and continuous adherence to the prescribed regimen was required throughout early childhood; dietary indiscretions always result in copious stools of the type which characterize celiac disease. However, the superior physical progress of these patients and their apparent tolerance for simple sugars indicate that something other than the strictly protein diet is called for in celiac disease.

Because of its ease of assimilability, dextrose is a very valuable adjunct in the feeding of the sick. Stearns and Moore[18] have reported the exceptionally rapid growth and recovery of a three-year-old child with severe malnutrition, which dated from infancy and which was associated with intolerance for complex carbohydrates. He was placed on a dietary regimen similar to that described by Nelson; his food utilization was excellent, as evidenced by his retentions of nitrogen, calcium, and phosphorus, and he gained 11 kg. and grew 14.5 cm. during a period of nine months.

Chronic malnutrition in older children has responded favorably to the same regimen. Stearns, Catherwood, and Kantrow[19] have reported comparative diet studies on five malnourished children, each from 10 to 20 per cent below the average weight for his height. The best and most consistent gain was obtained with a diet of high dextrose content (from 220 to 445 grams a day), high in its content of protein, minerals and vitamins, low in fat and in carbohydrates other than dextrose. More than 45 calories per pound per day were required; good gains were obtained when the value exceeded 50. To achieve similar gains with a diet high in fat and low in dextrose, from 250 to 500 calories more per child per day were required. The protein allowance was about 2 gm. per pound per day. Metabolic studies showed good retentions.

The diets just described are rational; they are composed of foods most readily assimilated, which tax the patient's energies to the least extent; they contain ample amounts of body-building proteins and minerals, and large supplies of vitamins. They can be used successfully for the nutrition of patients with greatly diminished absorptive capacity or of children with normal digestive function. Under the latter circumstances, constipation probably would be troublesome, because of the unnecessary restriction of foods with unabsorbable residue. The inclusion of coarse fruits and vegetables and the substitution of other sugars and starches for dextrose would make the diet suitable for the healthy normal child.

Constipation in children and infants is preponderantly dependent on faults in the diet; correction of the diet will result in relief in all except the small group with organic or functional disturbances which interfere with normal intestinal motility.[20] In very young infants, the commonest cause is insufficiency of food; the constipation is only a symptom of the more serious underlying deficiency. Through the use of supplementary or increased amounts of any well-designed milk feeding, normal bowel function may be expected. With the infant of three months or older, who is gaining weight regularly and at a good rate, constipation frequently depends on the absence of sufficient unabsorbed residue in the bowel. Rather than employing even the mildest of laxatives, it is better to add sieved fruits to the daily diet, offering gradually increasing amounts up to an ounce or two daily. The fibrous fruits (prunes, apples, peaches, pears, apricots) are best for this purpose; the sieved pulp is the effective agent, rather than the juice. The dried fruit is stewed and sieved and fed from a spoon. Constipation in the older child may be partly due to habit, but usually it is augmented by the habitual use of diets containing inadequate amounts of the coarser fruits and vegetables. The dietary regimen for a normal child, described in the first part of this presentation, usually will prove anti-constipating; if it is not, it can be supplemented by additional or larger servings of fruits and vegetables. Constipation per se should not be considered as an evidence of illness; it seems to have little or no deleterious effect on the general health.[21] It is evidence, however, of the existence of causative conditions, and in the great majority of instances these are purely of dietary origin.

THERAPEUTIC DIETETICS IN ALLERGIC DISTURBANCES

Students of allergy have demonstrated the responsible rôle played by tissue hypersensitivity in the causation and modification of many

diseases and minor disturbances of physiologic function.[22, 24] The ubiquity of hypersensitization, the appeal of the new to popular fancy, and the difficulties associated with the establishment or disestablishment of allergy as the principal agent of disease, have led to the attributing of many diverse disease stages to allergy. Let it be recognized that certain conditions obviously depend primarily on tissue sensitization; that in other conditions allergy is one of the important factors in the causation of disease; that in some other conditions the coexistence of allergy may modify the manifestations of a disease dependent on other primary etiologic factors. This recognition makes it necessary to consider the rôle which allergy plays in any given condition, but it should not blind the physician to the need for treating with equal vigor the nonallergic factors contributing to the disease. According to Vaughan,[23] allergy must be recognized as a pathologic exaggeration of a normal physiologic response, rather than a pathologic condition per se. Schick[24] distinguishes between physiologic degrees of sensitization and the more marked states of hypersensitivity; he would reserve the term allergy for the former and speak of the clinically apparent states of allergy as hyperergy. One must recognize that allergy is responsible for the changes which occur in the body fluids and tissues following specific infections, altering the response of the individual to subsequent exposures to these infections.[24] Sensitizations make their appearance following the introduction of many complex substances into the body; they persist for indeterminate periods of time but in general tend to disappear if contact with the sensitizing allergen is avoided.[23] While in the majority of instances there is little or no clinical evidence of the allergic reaction in the individual, it may become sufficiently marked to interfere with certain body functions, sometimes to such a degree that the condition is recognized as a state of disease. An individual may be clinically sensitive to numerous allergens in noteworthy degree or may respond only to a few. Because of the prevalence of sensitization[22] and the occurrence of marked allergic symptoms in the minority of the population, it is suggested that clinical allergy is dependent on intrinsic as well as extrinsic factors; the individual with pronounced allergy is predisposed through his hereditary make-up to attacks of an allergic nature, and sensitization which will occur as a matter of course in his contacts with his environment will serve to arouse this latent inherent pattern of response. Vaughan[23] states that from 7 to 10 per cent of the population show some outspoken manifestations of allergy; an additional 50 per cent show minor or transitory forms. From a fourth to a half of all individuals will show positive skin tests to various allergens. The list of disease conditions attributed to allergy is long and seems limitless; those with proved relationship are fewer but are of significant number and variety. Evidently certain conditions may have allergy as a contributory cause, yet may exist independently in the absence of demonstrable significant sensitization.

Foods may act as allergens; this is commonest during the first two years of life, and following the fifth year foods are progressively less important as a cause of allergic disease.[25] While the mechanism of sensitization to foods is not clear, it is generally considered to follow the enteral or parenteral introduction of the offending foodstuff or its incompletely digested components. As an explanation for those in-

stances of sensitization of the infant to foodstuffs which he never has been given in his diet, Hill[26] believes that they may have reached the fetus following their ingestion by the mother. The usual presence of clinical allergy in some other members of the family is emphasized by most writers on the subject. The foodstuffs most often incriminated in allergy are eggs, milk, and wheat.[22] While evidence is not conclusive, there is much to lend support to the opinion that sensitization is dependent solely upon the protein constituents of food and that products which are completely devoid of nitrogenous compounds cannot act directly as allergens.[27] An individual may be sensitive to one of the protein constituents of a food but not to others; through certain processing, some proteins may lose in varying degree their property of causing allergy. Ratner and Gruehl[28] have reported studies on the anaphylactogenic properties of milk in which they have compared the response of animals to whole raw milk, milk boiled four hours, canned unevaporated milk, evaporated milk, and dried milk. They state that milk sensitivity is most common to the lactalbumin and lactoglobulin fractions, less so to the casein fraction. Long boiling alters the first two, rendering them less anaphylactogenic. In the unevaporated products, however, the action seems to reverse itself after the milk cools, the products again assuming allergenic qualities. Heat incident to evaporation seems quite effective as a partially denaturizing medium, and individuals sensitive to the whey proteins (milk albumin and globulin) but insensitive to casein may tolerate evaporated milk well, whereas milk in other forms would incite a reaction. Hill[26] states that he has observed sensitivity to egg on numerous occasions where it was certain that the infant had not been exposed to egg since his birth; he attributes the sensitization to prenatal influences and considers the positive skin test as an index of the existence of clinical allergy. The sensitization to cereal products is a function of their protein content, not of the starch; Ratner and Gruehl[27] believe that while various grain products may serve as allergens, they lose this property if they can be purified sufficiently to eliminate the protein fractions. Thus, pure sugars are not allergens and may be used safely in diets of patients with allergy of any nature.

Various methods are employed to determine the foods responsible for allergic reactions in a given patient. Skin tests may be of value, but their evidence is not at all conclusive. The percentage incidence of positive reactors is much greater than those showing clinical evidence of sensitivity[23]; an allergic individual may give positive tests to substances which prove innocuous when tried clinically and fail to react by skin tests to other foods whose allergenic property is readily demonstrable. An individual's food dislikes are not related to his food sensitivities, and no weight should be put on such observations. On the other hand, the patient who is old enough to observe his symptoms in relation to the type of food he has eaten may be able to tell quite accurately that certain foods agree with him while other foods lead to illness. Often allergy to the suspected foods can be demonstrated, according to Vaughan.[23] If an accurate diary is made of all foods eaten, the offending foods may be detected through a correlation of the occurrence of allergic manifestations with the previous dietary. When such measures are insufficient, a special diet may be prescribed

for diagnostic purposes. Such diets, termed elimination diets, have been described by Vaughan,[23] Cobb,[25] and Rowe.[29, 30] They are made up of a minimum number of foods, these chosen from those least frequently concerned with the production of allergy, and with the exclusion of those causing positive skin tests or clinical symptoms in the patient. The resultant diet must be one which at least approximates all the requisites of normal nutrition, since it may be necessary to employ it exclusively for a period of two or three weeks or even longer before forming any conclusion as to the state of allergy. Preliminary to the institution of such a trial diet, Rowe[30] emphasizes the importance of ruling out causes other than allergy for the patient's symptoms. Hill[26] does not attempt to eliminate all foods causing reactions when multiple sensitizations exist, eliminating only those offering greatest evidence of reaction. Because of the uncertainty of composition of commercially prepared foods, none of these can be included in the test diet. Weight maintenance is assured through sufficient ingestion of the sugars, starches, and oils which are specified in the trial diet. Rowe[30] designs his group of elimination diets in such a way that he feels their content of vitamins A, B, C, and G is assuredly sufficient from the amounts of fruits and vegetables included; vitamin D should be included in the form of cod liver oil, halibut liver oil, or viosterol, making sure that the oily vehicle of the latter is one acceptable to the allergic state of the patient. Ultraviolet light may be substituted if circumstances require. He emphasizes that when milk is not offered, the protein content of the diet will be inadequate unless meat, eggs, or legumes are offered two or three times daily; in addition, 4 to 6 gm. of dicalcium phosphate should be given daily when milk is excluded from the diet, in order to maintain sufficient intake of these minerals. In the study of undernourished individuals or children, Rowe[30] offers first a test diet including milk, unless circumstances definitely forbid; suitable milk substitutes such as sobee or cemac may be used under such conditions, or milk may be reintroduced into the diet at the earliest possible moment. As a basic diet for patients with multiple or undetermined sensitivity, he suggests the following test regimen: one or more servings of rice, corn, tapioca, sago, sweet or white potato; one or more servings of lamb, beef, chicken, soy bean, lima bean, dried peas; one or more servings of spinach, carrot, beet, artichoke, asparagus, pea, tomato; one or more servings of lemon, grapefruit, pear, peach, apricot, pineapple. In the preparation of the foregoing, use sufficient amounts of the following: mazola, wesson, olive, or sesame oils; white vinegar if lemon is excluded; salt, cane or beet sugar, and glucose. Quantities of these sufficient to maintain weight should be used. While a whole group of the foregoing may be omitted if necessary, this is not desirable; the test diet must be made metabolically adequate. Rowe[29, 30] and Cobb[25] have published elaborately complete menus and recipes, offering series of elimination diets designed to avoid the ingestion of certain individual or groups of foods most commonly found to be allergenic. Vaughan[23] suggests that in eliminating certain foodstuffs, the biochemical or the phylogenetic nature of the suspected foodstuff be kept in mind and related foods be removed as well.

Once conclusions have been reached as to the nature and significance of food sensitivity, it is necessary to determine what dietary measures

should be taken. Diets prescribed for continuous use must be constructed with greater care than those used temporarily; since they are diets of exclusion, they also should include enough protective foods and of such a variety that avoidance of any degree of nutritional deficiency is assured. The various published diets for patients with allergy offer varying degrees of nutritional safety; some have been prepared with creditable care from the nutritional standpoint, whereas others appear to have been designed with the allergy in mind more than the welfare of the patient as an individual. It is well to remember that three decades ago, experimental animals were being offered synthetic diets thought complete in essential nutritive factors and that they failed to prosper equally with littermates receiving diets consisting of unrefined foods. While our recognition of nutritional essentials is broader now than then, there is no assurance that it is complete. Growing evidence indicates that better health is assured those receiving diets with generous amounts of protective foodstuffs than those with maintenance allowances. The diet of the allergic individual may easily be restricted to such a degree, through the substitution of biologically sterile energy sources for cruder foodstuffs that likelihood of deficiency disease of greater or lesser magnitude is not improbable.

Some controversy exists between students of allergy diseases as to the relative desirability of desensitization to offending foodstuffs as compared with their continued elimination from the diet. Vaughan[23] states that desensitization is unsatisfactory, that avoidance of offenders is better, and that such procedure will lead to a loss of sensitivity to them sooner than will be accomplished by desensitization. With avoidance, sensitivity may be lost within a few months, or a few years, or possibly never; he states that on the average about four and one-half years is required for specific sensitivity to be lost. Ratner,[31] in discussing the treatment of milk allergy, advises first the elimination of all whey proteins, rare beef, and beef serum. If the patient has no sensitivity to casein, evaporated milk may be employed during this period if well tolerated. Then a tolerance for unevaporated milk is developed gradually by giving graded amounts daily by mouth, starting out with one drop or even less, and building the daily intake up slowly until in the course of several months the customary amount is being ingested. Once tolerance has been attained, he states that milk must be ingested daily throughout life, to maintain desensitization.

Since specific food sensitivities come and go, it is wise to recheck the patient's state of food sensitivity from time to time, to adapt his diet to his progressive condition, or to restore him to a nonrestricted diet so far as possible.

Dietary Management of Infantile Eczema.—It is easy to eliminate egg and wheat products from the diet of the infant without incurring the risk of qualitative or quantitative nutritional deficiency. Many allergic infants will tolerate evaporated milk when milk ingestion[28] in any other form will result in an exacerbation of the eczema. Ratner[28] found that dried milk preparations, those treated by prolonged boiling, and a commercial milk product advertised as being hypoallergic still retained whey proteins in a form capable of producing allergic reactions in animals sensitized to those types of proteins. When milk of animals of other species is easily available, it may be

tried as a food for the milk-sensitive infant. Hill states, however, that infants sensitive to cow's milk usually react to goat's milk as well. He states that milk sensitivity of infants usually will disappear spontaneously within a few months. The products sobee and cemac—prepared from soy bean and beef, respectively, together with mineral salt mixtures, oils, and other protective substances—have proved of value as milk replacements. Each requires the use of additional foods as sources of energy. Ratner's work[27] indicates that pure crystalline sugars, dextrimaltose, or corn syrup may be used for this purpose, none of these serving as allergens.

The use of concentrated sources of unsaturated fatty acids has been recommended recently as a remedy for infantile eczema, on the premise that there is a deficiency of these acids in such infants.[26, 33, 34] While favorable results have been reported by some investigators, others report that no benefit has resulted from their use.[35] Linseed oil and corn oil are among the products recommended for this purpose. Sensitization to the protein of linseed oil has been reported following its use.

A correlation has been made frequently between the occurrence of eczema in infants and a tendency to obesity. Such infants seem to improve if their weight gain is checked moderately. Urbach[36] states that a reduction in caloric intake together with suitable local treatment frequently will result in healing of the lesions. He recommends feeding the atrophic eczematous infant in a manner to bring the weight up to normal. In the exudative form of the disease, he reduces the intake of fat and of salt.

A review of the literature on allergy and diseases attributed to that condition reveals many contradictory statements, and leads to the impression that much basic physiologic study will be necessary before dogmatic statements can be made concerning the causation, mechanism, and rational treatment of clinical hypersensitivity to protein. In the meantime it seems apparent that any therapeutic approach to these conditions must include attention to nonallergic as well as allergic factors in the etiology and that therapeutic measures which carry the probability of producing a suboptimal state of nutrition should be avoided. Careful planning of the prescribed diet should permit adequate nutrition and yet avoid the use of foodstuffs to which the patient is clinically allergic.

In a subsequent review the discussion of therapeutic dietetics will be continued.

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American Academy of Pediatrics

Proceedings

FIFTH ANNUAL MEETING OF THE AMERICAN ACADEMY OF PEDIATRICS

NEW YORK CITY, JUNE 7, 1935

Round Table Discussion on the Treatment of Rheumatic Heart Disease in Children

Chairman: Dr. Albert D. Kaiser, Rochester, N. Y. Assistant: Dr. May G. Wilson, New York City.

The meeting was called to order in the Hotel Waldorf Astoria by the chairman, Dr. Kaiser.

CHAIRMAN KAISER.—Rheumatic disease in children is receiving increasing attention on the part of investigators and clinicians. This, I believe, is not due to an increasing incidence of rheumatic infection but to a realization that so little definite information is available on this disease and that it now represents one of the foremost unsolved problems of childhood diseases. Interest in rheumatic infection is not universal, for in certain communities it arouses very little attention on account of its rarity, while in other sections of the country it represents a fair proportion of the physician's contact with pathologic conditions.

Rheumatic infection, especially when the most serious manifestation, rheumatic carditis, is associated with it, is readily recognized as a clinical entity. Some of the factors which are associated with the development of rheumatic heart disease are clearly understood while other factors are unexplained. Because of these unknown factors in the development of rheumatic infection, the specific and effective treatment and control of this disease has not been accomplished.

It seems advisable in this discussion to confine ourselves to some of the debatable matters rather than to review the accepted facts that may be associated with rheumatic heart disease.

The first subject to discuss is to state *the problem of rheumatic heart disease in childhood.*—Considered from the standpoint of numbers, rheumatic heart disease is not a serious menace to the childhood population. From 1 to 3 per cent of children of school age show clinical evidence of rheumatic heart disease. The seriousness of this disease is shown in the mortality rate of about 13 to 15 per cent during the first five years of the infection. Only a small percentage of those children who survive the five-year period are completely cured. Nearly 50 per cent will have recurrent attacks of rheumatism, and a high percentage will carry their infection into adult life and perhaps die prematurely because of their cardiac involvement. The invalidism associated with rheumatic heart disease may exceed the period associated with tuberculosis in childhood.

The problem of rheumatic heart disease exists among all classes though it is more likely to be found among the poorer classes. It has been stated that in England it is almost entirely an affliction of the poor. In this country such a distribution does not seem to be true. This infection is found in every strata of society in our eastern cities.

It is not likely that rheumatic heart disease is on the increase. Mortality tables show for all ages a steady increase in the number of deaths due to heart disease, but for the childhood period there is actually a decline in the number of children who die from heart disease. This does not mean, however, that the problem is being solved, for the decline in the death rate for this disease is less than the decline noted in any other of the infectious diseases of childhood.

Since the study of heart disease has received such an enormous impetus, the laity as well as the members of the medical profession have become interested in its occurrence. This unusual interest has its unfortunate aspects as well as its useful ones. Children with the slightest complaint referable to the heart and some overhearing discussions on the heart may present themselves as subjects suffering from heart disease. The widespread practice of school health examinations single out many children with so-called potential heart disease. When once a child is suspected of having heart disease, it is difficult to disillusion the child and banish the worry that children frequently experience with such an indefinite diagnosis. It is becoming increasingly important for the physician to make a correct diagnosis of heart disease and not call any slight deviation from normal, heart disease. Great harm can be done to the child, especially to the adolescent child, by treating a condition that does not exist.

The question naturally arises: Can rheumatic heart disease always be correctly diagnosed and, if so, what criteria should be utilized?

The problem of diagnosis is encountered chiefly in the milder types of involvement in which the history of previous infection is vague or lacking. Seham has suggested definite means of diagnosis which offer valuable help in separating children with no heart disease from those with heart disease. The following factors, he states, should be carefully investigated:

1. History of rheumatic infection
   - Rheumatic fever
   - Chorea
   - Growing pains
2. Fever
3. Tachycardia
4. Thrill
5. Pulmonary congestion
6. Circulatory signs
7. Weight-height index, 10 per cent below
8. Murmur
9. Abnormal roentgen ray observations
10. Abnormal esophagographic observations
11. Abnormal electrocardiograms

These factors can generally be accurately elicited. The interpretation of the murmur is likely to cause some uncertainty. To differentiate between functional murmurs and organic murmurs is not a simple matter. The importance of deciding whether a murmur is a functional one or an organic one cannot be underestimated. Interpretation of a functional murmur as an organic one may sentence a child with a normal heart to "cardiac invalidism." Such a child may become introspective and despondent, and oversolicitousness on the part of the parents tends to lead to behavior difficulties. Functional murmurs occur frequently. From 8 to 20 per cent of children have been reported to show functional murmurs at one time or another. Though many attempts have been made to distinguish a functional murmur from an organic murmur, no satisfactory differentiation has been advanced. In the evaluation of the significance of a murmur, particularly of one heard over the cardiac apex, the decision rests almost entirely with factors other than those relating to the murmur itself. The murmur heard early in the course of an acute rheumatic

infection is frequently soft and blowing and per se may be indistinguishable from a functional murmur. However, the history, together with symptoms and signs of the disease, should serve to differentiate the condition. It is here where the various factors such as x-ray examination and electrocardiogram may be of aid.

The etiology of rheumatic heart disease is a matter of considerable importance to the physician. The treatment to be instituted may be influenced by the factors that preceded the cardiac involvement. To understand the etiology of heart disease presupposes a knowledge of the causes of rheumatic infection. Unfortunately the causative factors in rheumatic infection are still unknown. Certain related factors, however, are understood, and their recognition guides the therapy. It is anticipated from statistical studies that about 65 per cent of the children with rheumatic fever will develop rheumatic heart disease. In fact it is contended by some investigators that 100 per cent of the children with such a complaint have cardiac involvement. The evidence is not always discernible so that one cannot be sure of the heart involvement. In chorea the incidence of cardiac involvement is somewhat less, about 50 per cent. In the case of children complaining of growing pains or muscular pains the incidence of carditis is about 15 per cent. In approximately 12 per cent of the children studied with undoubted rheumatic heart disease, no previous history of any rheumatic manifestation could be obtained. Much has been written about the significance of tonsillitis and nasopharyngitis as the preceding infection in heart disease. It undoubtedly is the rheumatic manifestation that precedes cardiac involvement in some cases. Efforts to explain a close causal relationship between tonsillitis, rheumatism, and heart disease meet insurmountable difficulties. Tonsillitis is a common infection in approximately 35 per cent of all school children. Yet the incidence of all types of rheumatic infection is less than 8 per cent and less than 2 per cent for rheumatic heart disease. In many cases of rheumatic infection no history of tonsillitis or sore throat is obtained. It seems certain that some other unknown factor must be responsible for rheumatic heart disease.

The knowledge that rheumatic disease is most likely to develop between seven and twelve years of age, that it is more prevalent in certain communities such as in the north temperate region, and that it tends to improve or disappear in certain warm localities, is all interesting but has not been of any great help in preventing this infection. The partially understood factors that are supposed to be related to rheumatic infection deserve considerable discussion. Mentioning them may elicit some discussion. Is the hemolytic streptococcus the true etiologic agent in rheumatism? Is a virus associated with this disease? Is it contagious? Is that why it tends to become a familial disease? Is there a family susceptibility to this infection? Does a vitamin deficiency predispose to this disease? Is there a chemical imbalance responsible for the selective action that streptococci display in certain individuals? These queries and others constitute what may be termed the unknown factors in rheumatic heart disease. Investigations under way will soon furnish a reply for some of these questions, but until they are solved all types of rheumatic disease will not be understood.

The treatment of rheumatic disease is a subject for considerable discussion. Inasmuch as the etiologic factors are still an enigma, treatment has been suggested from various angles. A disease in which pain is usually an outstanding complaint or in which the nervous and skin manifestations are annoying to the parent demands some form of treatment that will bring relief to the individual. Drug administration has been found most helpful in arthritic conditions. Unfortunately the relief of symptoms due to drug administration may prevent the patient from getting the necessary rest which is perhaps of greatest importance in safeguarding the heart. Though various drugs such as cinchophen and amidopyrine have recently been tried

successfully in the treatment of rheumatic infection, the salicylates in their various preparations still seem to be generally used. The administration of drugs has usually been restricted to initial attacks of rheumatic infection and at the time of recurrences while in the interim no therapy has been employed. A number of studies conducted recently suggests that the prolonged use of an antirheumatic drug may be of benefit in preventing recurrent attacks of certain rheumatic manifestations.

The artificial production of heat, first tried in the treatment of chorea, is now being applied to individuals with rheumatic fever and rheumatic heart disease. It is generally admitted that the symptoms of chorea may be promptly relieved by the intravenous injection of typhoid vaccine or by producing pyrexia in heat chambers. Its application to other forms of rheumatic disease is not well known and deserves discussion.

For awhile the use of vaccines in the treatment of this disorder promised to be of some value. It appears that recent studies nullified some of the advantages first reported. Undoubtedly the method of treatment deserves further study. Based on the assumption that rheumatic children have some constitutional susceptibility which may be due to some chemical or vitamin deficiency, dietary changes have been advocated. A possible disturbance of vitamin C utilization has been suggested as a constitutional weakness in the rheumatic child. Increased amounts of vitamin C have therefore been advised. Our own studies on vitamin C have not demonstrated a deficiency of this vitamin in the blood of rheumatic children. This is, however, an important field for research.

The removal of foci of infection received careful attention during the last fifteen years. At times not only was there a cessation of rheumatic symptoms, but the inevitable recurrences failed to appear. These occasional brilliant results raised the hopes of clinicians in the treatment of this condition. However, after a period of time statistical studies revealed the fact that even after the removal of foci of infection recurrences developed and frequently rheumatic carditis ensued. The removal of the tonsils which were usually incriminated in the presence of this disease failed to bring about the desired result. Nevertheless, the clinical experience demands attention to known foci of infection even though the statistical evidence of their importance is not convincing.

The geographic distribution of rheumatic disease suggested that certain climatic conditions were unfavorable for the existence of rheumatic infection. Sending children known to have a rheumatic infection to our southern states or to the West Indies has been the means of aiding these children to a greater degree than any other method of treatment. The impracticability of doing this for any considerable number of children makes this form of treatment available only for the well-to-do class. Further investigation as to the reason that tropical climates benefit rheumatic individuals may some day reveal a way of giving these benefits to children in temperate regions.

In spite of careful treatment and prolonged convalescent care, rheumatic heart disease will frequently develop in children infected with the rheumatic poison. Even more discouraging is the treatment of rheumatic heart disease. Under the most favorable conditions the end-results are disappointing. Stroud recently reported on the end-results of 307 children who had rheumatic heart disease and found that 40 per cent were either hopelessly disabled or dead at the end of ten years. This state of affairs is a real challenge to scientific medicine. It cannot be stated that no progress is being made in the control of this disease. Attempts at immunization, desensitization to streptococci, recognizing vitamin deficiency in individuals—any of these procedures may reveal a solution to the rheumatic problem. A discussion of the attempts to utilize these procedures will be of interest to this group, and I hope will subsequently be brought out in our general discussion.

DR. WILSON.—Treatment of rheumatic fever in children was discussed:

I. In its relation to current views of its etiology
   A. Environmental predisposing factors
      1. Housing, food, hygiene, clothing
      2. Climate (change of residence, locality, sanatorium)
      3. Contact infection
   B. Prevention of infections (the rôle of respiratory infections)
   C. Removal of foci of infection (tonsils, teeth, sinuses)
   D. Rôle of salicylates
   E. Vitamin deficiency.
   F. Serums and vaccines
   G. Fever therapy

II. Evaluation of therapeutic measures in relation to the natural history of the disease
   A. Influence of treatment on symptomatology
   B. Influence on course of disease
   C. Prevention of occurrences and recurrences of the disease.

SUMMARY OF DISCUSSION

DR. WILSON.—The importance of the various predisposing factors which would tend to lower the general resistance of the rheumatic child is stressed. Although at the present time there is no conclusive evidence that any of these factors are of specific etiologic significance, our efforts should be directed to favor and improve the general health of these children. The reports given here by representatives from various southern localities concerning the relative prevalence of rheumatic fever would indicate that opinion as to the specifice rôle of climate in this disease must be reserved. The various specific and nonspecific serums and vaccines which have been used have not met with success and are still only of experimental interest. The importance of caution in evaluating the results of therapeutic measures was emphasized. A long period of observation and a comparable and sufficiently large series of control subjects are essential.

DR. ALEXANDER MARTIN (NEW YORK) stressed the value of the convalescent care of children with rheumatic heart disease. He felt that acute upper respiratory infections were likely to activate the cardiac lesion in these rheumatic children. The importance of watching the sedimentation rate in these children was stated.

DR. ALFRED J. SCOTT (LOS ANGELES) discussed the incidence of rheumatic disease in southern states. Chorea was rarely discovered among children in his experience, but rheumatic carditis was not infrequently noted.

It was brought out in the discussion by various physicians living in the southern states that the classical rheumatic manifestations were not common in their localities but that the disease does occur in a milder or modified form.

DR. L. T. ROYSTER (CHARLOTTESVILLE, VA.) discussed the effectiveness of the electrocardiograph in directing the prolonged care of the cardiac child. It also is of great value in deciding whether a child has an organic lesion or is suffering from a so-called functional heart disturbance.

The rôle of the tonsils in the prevention and treatment of heart disease is not clear. There seemed to be general agreement that tonsillectomy will occasionally bring about a cessation of rheumatic symptoms though statistically there is very little evidence to support this belief. There is, however, good evidence that the mortality among children with rheumatic heart disease is considerably less in those in whom the tonsils have been removed before the rheumatic heart disease is evident or when it has once been established. It appears wise in the present knowledge of this disease to offer the child this possible benefit even though rheumatic manifestations are not eradicated.

REPORT OF BUSINESS MEETING OF REGION III OF THE AMERICAN ACADEMY OF PEDIATRICS

The business meeting of Region III was held in St. Louis, Mo., Nov. 19, 1935, with Dr. Henry Helmholz presiding.

The order of business was as follows:

I. Report of State Chairmen.

1. Dr. Gengenbach, of Colorado.
2. Dr. Blatt, of Illinois.
3. Dr. Winters, of Indiana, reported for Dr. Torian.
4. Dr. Hill, of Iowa.

Comment was raised over the diphtheria immunization plan reported by Dr. Hill. The point was raised by Dr. Blatt that immunizaton done in Schick-negative infants who have not lost their immunity may change the child to Schick-positive, and that thereafter difficulties are encountered in making the child Schick-negative again.

Dr. Helmholz suggested the matter was of sufficient importance to refer to Academy committee.

The motion was made by Dr. Feldman, was seconded, and was carried.

5. Dr. Carson, of Kansas.
6. Dr. Martmer, of Michigan.
7. Dr. Berger, of Missouri.
8. Dr. Huenekens, of Minnesota.
9. Dr. Moore, of Nebraska.
10. Dr. Pray, of North Dakota.

Dr. Pray in his report brought up the question of Academy requirements for admission to membership. He wished to know whether or not part-time pediatricians were eligible. Also he wished to know whether or not it was the policy of the Academy to give him backing in projects undertaken in North Dakota.

Dr. Grulee answered by saying that the Academy requirements differed in different regions. Region II admits no one unless he is doing strictly pediatrics. In Region III part-time pediatricians have been admitted provided that the consent of other Academy members in the state has been secured. Dr. Helmholz commented that the latter was the policy in Region III.

Dr. Grulee assured Dr. Pray that the Academy would support any reasonable project in his state.

11. Dr. Ashmun, of Ohio.
12. Dr. Zimmerman, of South Dakota, was not present.
13. Dr. Schwartz, of Wisconsin.

Dr. Blatt gave report for Committee on Standardization of State Program.

A motion was made by Dr. Harvey, of Pontiac, Mich., was seconded that the report of Dr. Blatt be accepted and that the Committee be continued; the motion was carried.

A motion was made by Dr. Miner and seconded by Dr. Martmer that a vote of thanks be extended to local Academy members in St. Louis for their courtesy during the meeting; the motion was carried.

A motion was made by Dr. Huenekens, of Minneapolis, and seconded by Dr. Martmer that vote of thanks be extended to Southern Medical Association for invitation to meet with them; the motion was carried.

Dr. Helmholz presented resolution of Chicago Pediatric Society resolving to present name of Dr. Isaac Abt for presidency of American Medical Association, and suggested that other Pediatric organizations of the country might submit similar resolutions indorsing Dr. Abt.

The meeting was adjourned at 12:15.

Reports of State Chairmen

Dr. F. P. Gengenbach, Colorado State Chairman.—During the year of 1935, the members of the Academy have participated in the activities of the Denver Public Health Council, the Council of State-Wide Health Agencies, and the completion of a state-wide survey of crippled children.

In preparation for the work to be done under the Social Security Act, the State Medical Society has appointed a committee, the chairman of which is a member of the Academy, Dr. J. W. Amesse.

An effort was made during the sessions of the legislature to pass a bill to reorganize the State Board of Health and to form a State Department of Public Welfare. Both efforts failed but a new Executive Secretary of the State Board of Health has been appointed with a year's leave of absence for postgraduate work at Johns Hopkins. During his absence the position will be filled by a substitute furnished by the U. S. Public Health Service, thus assuring much better cooperation than in the past.

Dr. Maurice L. Blatt, Illinois State Chairman.—The activities during the past six months in Illinois consisted of a scientific meeting of the Pediatric Section of the Illinois State Medical Society at their annual meeting on May 21, 1935, at Rockford. In addition, papers on pediatric subjects were presented before other sections of the Illinois State Medical Society at this meeting.

Following the section meeting, there was a meeting of the Academy members present.

It was decided that members of the Academy write a number of papers for the Educational Committee of the Illinois State Medical Society on pediatric subjects for newspaper release. The responsibility for subjects and assignment to members was given to the chairman. The list of such assignments was accompanied by a letter, an excerpt from which follows:

"The House of Delegates concluded that interviews or articles of an educational nature on medical or health subjects, intended for the lay press or lay audiences, should give expression to the consensus of opinion of the medical profession rather than to personal views which may be in conflict therewith and that articles should appear preferably under the auspices of the American Medical Association or one of its component societies or constituent associations.

". . . discussions of new discoveries, of proprietary products, and of special notions may well be confined to medical periodicals, which constitute an open forum for determining the actual status of things in dispute."

The same paragraph applies to all papers delivered over the radio.

A questionnaire prepared at Dr. Grulee's suggestion on the state pediatric organization and pediatric medical service was compiled with the aid of a trained social service worker. After consideration the Illinois Academy members voted that no use be made of this questionnaire pending one which it was anticipated Dr. Martha Eliot would send out.

For Illinois, a committee composed of Dr. Arthur Parmelee, Dr. Henry Irish, and myself, members of the American Academy of Pediatrics, revised a book on infant and child care. Each chapter was written by a pediatrician, a member of the Chicago Medical Society, and so far as I know, each one a member of the American Academy of Pediatrics. This will eventually have wide circulation in the state as it will be distributed with a letter from the State Department of Health.

The Department of Public Health of the state, under Dr. Frank Jirka, and the head of the Department of Child Welfare, Dr. Grace Wightman, are entirely in sympathy with the activities of the Academy.

The relationship between the American Academy of Pediatrics and the Illinois State Medical Society has been one of utmost harmony. Its educational committee,

Dr. R. R. Ferguson, chairman, with its permanent secretary, Miss Jean McArthur, cooperated whole-heartedly with any suggestion offered by the Academy.

Miss McArthur has rewritten for newspapers and health publications many of the radio and health talks given by members of the Academy—the extent of this work may be visualized by a summary of the work produced during September and October of this year:

Talks on pediatric subjects before lay groups:	
By doctors in general practice	17
By pediatricians	15
Talks before scientific meetings:	
By doctors in general practice	2
By pediatricians	7
Two clinics for crippled children conducted (Whiteside and Warren counties):	
Radio talks on pediatric subjects	20
Releases to newspapers, September, October, to November 9 (these were on pediatric subjects):	
Blackhawk Park Nursery School	18
Regular monthly service to papers	40
To papers	409
Total	467

In addition, hundreds of copies of the radio talks made by the Chicago Pediatric Society have been sent to libraries in Illinois. These were broadcast over Station WJJD during 1931 and 1932, and were written by members of this society. In the library, they form the basis for study of subjects connected with pediatrics; they are used by local writers, teachers, and school children.

Dr. Matthew Winters, Indiana State Chairman.—Our plans for the state include first a tuberculosis survey, which we have well under way in one high school in Indianapolis. We are trying this on one school and intend to extend it after we work out our errors. We are awaiting now funds for the : ay part of this project.

Our main work in the state of Indiana is one of education. We spend a great deal of our time in improving the pediatric set-up at the Indiana University School of Medicine and have tried to make our courses of study correspond to those recommended by the Academy. We also have a postgraduate committee which takes care of speaking engagements before county medical societies throughout the state and which has sponsored several postgraduate assemblies in pediatrics.

I expect, during the coming year, to make contact with the Parent-Teacher organizations and through them carry on an educational campaign the details of which have not been worked out; but in my work here I find the Parent-Teacher organizations very cooperative.

Dr. Lee F. Hill, Iowa State Chairman.—The report from Iowa, as in previous years, is one concerning the activities of the State Committee on Child Health and Protection. This is a standing committee of the Iowa State Medical Society appointed by the president and reporting before the House of Delegates at its annual meeting.

The Committee now consists of seven members—three pediatricians, two obstetricians, and two general practitioners—two new members having been recently added. The enlarged committee considers the problems of maternal welfare as well as those of child welfare.

As I have stated previously the Committee's chief function is to serve as a connecting link between the State Department of Health and the Iowa State Medical Society. It also cooperates with the speaker's bureau of the state society and

with the various lay organizations of the state active in maternal and child health. The chairman of this committee is a member of the council which represents these lay groups. During the last year one or more members of our committee have attended these council meetings and have taken part in the discussions.

The Committee has also interested itself in securing pediatric recognition on the program at the annual meeting of the Iowa State Medical Society.

In the past the Committee has reviewed all of the literature put out by the State Department of Health and has cooperated with it in its program of immunization being carried out in the various counties of the state. The Committee and the State Department of Health are cognizant of the relatively bad position of Iowa regarding the amount of smallpox present in the state, and steps are being taken to relieve this condition.

A plan, which might be called an experimental plan for diphtheria immunization, is being carried out this month in Polk County—the county in which Des Moines is situated. Cases of diphtheria and deaths from it still occur in this area in spite of free immunization being done by the City Health Department for anyone presenting himself or herself for it.

The plan is build on the premises that immunization ought to be done during the latter part of the first year of life; that the actual administration of the preventive agent ought to be done by physicians in their offices; and that they ought to receive a fee for their services. Furthermore, it was recognized that any effective plan for diphtheria eradication must include provision for the immunization program to be carried out year after year.

Out of a total membership of approximately 200 in Polk County Medical Society, 109 physicians agreed to be in their offices from 11 to 12 on each Saturday morning during the month of November, to give one dose of alum-precipitated toxoid to any infant or child presented at this hour. They agreed to do this for a fee of $1. The participation of the Parent-Teachers' Association was secured, and members of this organization visited the parents of all infants of the desired age group, explaining the plan, and leaving literature. The radio, press, and street-car placards were used. A vial of alum-precipitated toxoid was furnished each participating physician free of charge by the City Health Department.

It is hoped that this plan will educate the general practitioner in the administration of toxoid and the proper age at which it should be given. Also it is hoped parents will be educated to seek it for their children while the children are still in infancy. If these aims are accomplished, an annual campaign can eventually be discontinued.

More recently our committee has been cooperating with the State Health Department in a discussion of Title V of the Social Security Act. A half-day session has already been spent in considering means for the effective disbursement of federal funds under the first part of Title V—which has to do with Maternal and Child Welfare. These funds will be under the control of the State Health Department, but the plan and the personnel and their expenditure must receive the approval of the Children's Bureau in Washington. Furthermore, they must be expended in areas of greatest economic distress and in rural areas.

On November 21, the State Health Department, the Committee on Child Health and Protection, and the Council of the State Medical Society will meet again for a discussion of a plan which will have been drawn up by the Health Department.

The plan will undoubtedly encompass such features as the education of expectant mothers, education of physicians through lectures and addresses, and immunization of infants and children.

Dr. Paul G. Carson, Kansas State Chairman.—The report for Kansas is one of progress. We are continuing our immunization program, speaking to P. T. A.'s

when possible, and we have offered our services to the State Board of Health in connection with this matter of the national program under Dr. Eliot.

Dr. Edgar E. Martmer, Michigan State Chairman.—The work of the Michigan members has been largely along educational lines. We have attempted to promote both the postgraduate teaching and education of the laity.

In our postgraduate teaching, most of our efforts have been concentrated upon the three-day course for general practitioners given by the members of the American Academy of Pediatrics at the Children's Hospital of Michigan in Detroit. Our first course was given last spring and met with much greater success than we had hoped. The daily attendance for the three days was over sixty men from out in the state. We are planning on repeating this course, covering a different group of subjects, next spring. In addition to this, the members of the Academy are cooperating with the postgraduate extension courses given in cooperation with the State Medical Society, the University of Michigan, and Wayne University. Under this plan, a man will cover one subject in the morning, and a second man another subject the same afternoon. These meetings are held once a week for ten weeks; six units are operated throughout the state.

By cooperating with the Detroit Pediatric Society, the Wayne County Medical Society, and the Detroit Department of Health, we have been able to have a weekly program on the Michigan radio network covering pediatric subjects. In one of the larger newspapers, through cooperation with the Detroit Pediatric Society and the Wayne County Medical Society, it has been possible to carry on a series of newspaper articles covering infant and child care. We feel that education of the laity is an important part of that program and make every effort to assist in the ethical presentation of pediatric information in an effort to combat the large amount of misinformation which is constantly being offered to the public.

We have been able to secure the appointment of one of our members to the Radio Committee of the State Society and the Wayne County Medical Society, thus controlling the pediatric information broadcast.

Through cooperation with the pediatric section of the State Society, a committee has been appointed composed of Academy members, who are likewise members of the State Society, to complete a survey of the use of iodized salt, which was begun several years ago. The original committee was responsible for the introduction of iodized salt in Michigan.

Our efforts toward increasing membership have been greatly curtailed because we feel that with few exceptions all of the men in Michigan who are eligible for membership in the Academy have already applied. Those few who have not done so are planning to apply as soon as their financial condition will permit.

Dr. Harry C. Berger, Missouri State Chairman.—We have now a well-organized and active pediatric society including Joplin, Carthage, Springfield, St. Joseph, Topeka, and Kansas City, Kansas.

The meetings are held once each sixty days, when a scientific program follows a dinner, and this in turn is followed by a free, general discussion. There is much interest displayed, and the men come from all of the centers mentioned. Everyone interested in pediatrics is welcome and attends. However, only members of the American Academy are Class A members. Others are Class B or Class C members. It seems well to enlist the support of as wide a representation as possible to boost any project we want to put under way, and many of the men who are competent doctors and practicing pediatrics are still not eligible to membership in the Academy.

We are ready to carry forward any plan sponsored by the Academy and have in mind some plans of our own to inaugurate. We have developed the closest type of cooperation with the Children's Bureau, and through it, of the P.T.A., which gives us a very strong tie to a powerful lay organization.

So much for the western half of the state. From the eastern half we have nothing. It is my firm conviction that because of the geographic location and the wide divergence of local problems, one state chairman to cover both Kansas City and St. Louis will never be successful. It would seem that one man in each place cooperating closely and with frequent conferences would be highly desirable. It would be well to have either two chairman in the state or one chairman and one vice-chairman.

Dr. E. J. Huenekens, Minnesota State Chairman.—When I accepted the position of chairman for Minnesota six months ago, I found we had a very excellent set-up in Minnesota for public health work of all kinds. There were not only efficient infant welfare organizations in the large cities, but the State Bureau for Maternal and Child Care was well manned and was doing an able piece of work. There was unusual cooperation between the extension division of the University of Minnesota, the State Medical Society, and the Minnesota Public Health Association; Dr. E. R. Meyerding serves as part-time secretary of both the State Medical Society and the Public Health Association. Through these three organization, diagnostic clinics are given throughout the state for the laity, and separate clinics and lectures are arranged for the county medical societies.

In view of this situation, I felt that, since these organizations already in the field were adequately performing many of the tasks that the Academy had set for itself, the best thing I could do would be to offer the cooperation of the Academy and myself in doing their work. This offer of cooperation has been gratefully accepted, and we are all working harmoniously together. If separate action by the Academy should later be necessary, it will be undertaken.

Dr. Clyde Moore, Nebraska State Chairman.—The Nebraska State Committee has nothing in particular to report. We are still working through local organizations, such as the School Health Committee.

The various plans for child health and infant welfare sent out from Washington are so indefinite that all we can do is to try to keep in touch with the work suggested for this state. So far we have been unable to get anything more than a promise that we would be represented on the committee which will outline plans.

Most of our activities are in connection with the Nebraska State Pediatric Society which meets monthly in Omaha or Lincoln.

Dr. R. E. Pray, North Dakota State Chairman.—It is best first to introduce the state of North Dakota to give you some idea of the problems we confront. The general population is about 500,000, scattered over many, many square miles. The population of the largest town is about 29,000; there are about ten towns of five to seven thousand. Another doctor and I are the only two in the state practicing pediatrics exclusively, and in order to make this a success, one must of necessity be associated with a clinic or group practice.

The medical societies and the state association have been very lax in their efforts to assist in the development and training in health matters. Now, with the Social Security Bill definitely on its way, the physician will probably be stimulated to have a great deal more representation than in the past. Control of our state health program has been under Dr. Maysil Williams for the past few years, and she has attempted to work with the medical association without apparent success; the county and town political agencies have been in control of the finances back of the program locally. This has resulted in a political control of the health situation, and with the financial condition of the state such as it is, it has been only too easy for these political units to gain the cooperation of one or more physicians locally in the community to the detriment of the others. There has been very little oppor-

tunity here for a pediatrician as such to make any dent in the program or to assist in establishing a cooperation and a program more in keeping with the standard as desired by the Academy.

The improvement in health conditions of the state as kept by the State Health Department conform pretty definitely with the improvements as seen throughout the entire United States. Perhaps the failure of the medical men to establish a program in health, as it concerns infant mortality and maternal death rate, has resulted in the political powers taking this over through the health departments.

Any progress which has been made in gathering statistics and advancing the education of the public has been carried on largely through the nurses, supervised by interests outside the profession. The public in this state have now begun to assume that the nurse is in position to diagnose and treat on a par with the medical man, and we can blame no one but ourselves for this situation.

The part that I, as a representative of the Academy in North Dakota, can play is probably that of attempting to organize those men most interested in pediatrics and through this organization establish a set-up which will be able to work with the program as it will be established through the Social Security Act. We will, however, need to feel that the American Academy of Pediatrics will not only stand by us in our efforts but will give us frequent information as to the moves best suited for our advancement in carrying out the wishes of the Academy.

Dr. Sterling H. Ashmun, Ohio State Chairman, reported the following:

Special meetings held during year, 1.

Membership in state, 60.

Eligible to membership, approximately 72.

Applications now pending, 4.

Cooperated with State Society to obtain representatives on committees in State Society.

Appointment by state director of welfare of state chairman to advisory committee or staff director of work in connection with the Social Security Act when and if appropriations are made.

No definite participation in postgraduate courses, except by members as individuals.

Cooperation with section of pediatrics in State Medical Society. No separate state group in Ohio.

General attitude of members, excellent, economically alert. State members voted their cooperation with P. T. A. groups, but discourage the idea of free examination at "spring round-ups," which are mere inspections and should not be considered examinations.

Public health association to continue education but to refer actual work of immunization to physicians.

One delegate to State Society House of Delegates.

One member on Child Welfare Committee of State Society.

Dr. A. B. Schwartz, Wisconsin State Chairman.—The uncertainties of the past year in the field of economics have had the happy effect of putting our local medical organizations on their toes. The Academy membership though small has tried to lend direction to these activities of already alert county and state medical societies.

We have in the main tried to perform an educational function. This has taken three directions:

First, the education of the pediatric group in the allied fields of child welfare. As an example, we replaced a clinical meeting of our local pediatric society with a demonstration program at which the workers of one of our local social agencies were the performers.

Second, an educational program for general practitioners. This is being done by a regular instruction on some phase of preventive medicine printed monthly on a card and mailed to every member of a county medical society. These are prepared by the Child Welfare Committee of the Milwaukee County Medical Society. (Academy members represent half the membership of this committee.)

Third, an educational program of the public, by directly and indirectly, through the county medical society and other agencies, promoting the idea that preventive medicine is both our tradition and present-day concern. As illustrating this phase of interest, we are now in the process of making a survey of available care for the defective child.

Regarding the Social Security Act, the State Medical Society in cooperation with the State Board of Health has already appointed a Committee on Child Health and Protection, which will draw up the program for the maternity and child welfare activities as soon as the funds are made available. A tentative program for these activities has already been considered.

Report of the Committee on Standardization of State Programs

At the Rochester meeting of Region III on Oct. 4, 1934, Chairman H. F. Helmholz appointed a committee on this subject.

Members of the committee are Dr. B. W. Carey, Detroit, Mich.; Dr. Lee F. Hill, Des Moines, Ia.; Dr. Oscar Torian, Indianapolis, Ind.

The following program was compiled and sent to each member of the committee. Comments were that the program in general was satisfactory, but that each state should take advantage of what it had already organized.

MAURICE L. BLATT, Chairman.

Outline of the Program for Region III of the American Academy of Pediatrics
(M. L. Blatt, M.D.)

The object of this program is to:

1. Elevate the plane of health of infants and children in the region.

2. Increase the general practitioner's knowledge of the prevention and cure of disease in childhood.

3. Enhance the dignity of that branch of the profession which devotes its efforts to pediatrics as a specialty.

4. Assume leadership in all problems concerning the prevention and cure of diseases of childhood and in all public and private organizations having to do with the welfare of infants and children.

5. Take advantage of the Social Security Act—Title V, Parts 1, 2, and 3. To assume leadership in carrying out the provisions of this act: (a) by coordinating the activities of the state departments of health; state medical societies; departments of public welfare; Parent-Teachers' Association; Visiting Nurses' Association; social service agencies interested in maternal and child welfare; state hospital associations; state dental associations; state druggist associations; the American Legion; state departments of education; organized private charities; organized religious charities; the Masonic groups, and the Elks.

In order to accomplish the purpose of this program, the following agencies should be used:

The organized medical societies of states, counties, and cities, medical colleges and dispensaries, Visiting Nurses' Associations, and child welfare organizations.

a. Lectures and demonstrations by obstetricians on prenatal care and by pediatricians on all matters pertaining to postnatal care of infants and children. For this purpose, charts, lantern slides, and moving pictures will be found of great assistance.

Plan of Instruction: For the general practitioner, a course of consecutive and planned lectures and demonstrations on prenatal and postnatal problems in childhood, with special emphasis on preventive medicine. These courses should be *taken to* the practitioner at meetings of the organized medical society in his city, county, or district. Opportunity to present the subject before such meetings should be sought through the state medical society, district councilors, or county presidents.

a. The course of lectures should be so arranged that there will be no repetition to a given group of physicians within a three-year period.

b. The subject should be of practical value to the man practicing medicine in his own community. Advance in technic, the value of which is in dispute, should not be stressed.

Teamwork: This work should be done by teams organized by the state chairmen of the American Academy of Pediatrics. Popular pediatricians should be selected to head each team, and younger men who will be able to carry on in the future should be assigned to it.

One or two subjects should be assigned to a man, so that the program may be constantly in readiness, and when opportunity arises to present it before a medical group, these men will need little time for preparation. Attempt to balance subjects assigned to each team and put the team as a whole on individual programs if possible.

State Medical Society—Section on Pediatrics: It is advisable to form a section on pediatrics in the state medical societies. This section should have, at most, two sessions, one morning and one afternoon. The papers read should be on subjects of interest, not to pediatricians especially, but to the general practitioner in his everyday handling of medical problems. In Illinois, a single half-day session was found adequate in 1934.

Here, as in the county and district, it is better to *take the information to the physician* than it is to anticipate his coming to a special meeting to obtain information. In a three-ring circus, such as a state medical society meeting, it is usually difficult to get a physician primarily interested in surgery to leave his section for the purpose of acquiring some newer knowledge of pyloric spasm from a pediatric group.

An effort should be made to have a pediatrician in as many sections devoted to the specialties as is possible. The man should be picked because of his familiarity with the particular problems which confront the special section. The subject should be the pediatric phase of a problem pertaining to their specialty.

State, County, and City Departments of Health: For the purpose of creating a feeling of mutual confidence between pediatricians and the various departments of health, the cooperation of this group of physicians should be obtained. Personal contact, invitation to be present at meetings, and public acknowledgment of their constituted authority are conducive to close harmony of action.

It should be understood that their function is gathering statistics, dissemination of epidemologic knowledge, prevention of the spread of contagious diseases, examination of food and water supply, institution of campaigns in preventive medicine, and the supplying of many biologicals. It should be understood also that the direct contact with the family and family groups is the problem of the physician engaged in private practice, and this should be jealously guarded.

Specific Program: A. Prenatal Care: In order to reduce infant mortality at birth, a wide dissemination of the knowledge of the value of prenatal care is essential. Through the joint effort of obstetricians and pediatricians, use of the press, radio, and public speaking to medical and lay groups, under the auspices of the state medical society, this propaganda may be spread. Papers on this subject should

be read year after year before the general meetings in the county and state medical societies:

The subjects to be stressed are:

The treatment of syphilis in the mother.

Hygiene of pregnancy

1. Adequate rest for the expectant mother
2. Prevention and cure of vaginal infection
3. Care of breast and nipples
4. Vitamins during pregnancy
5. Adequate diet during pregnancy
6. Constipation and hemorrhoids
7. Coitus during pregnancy

Danger signs in pregnancy: (a) to mother and (b) to baby.

The value of the pelvimeter.

First signs of labor.

B. Care of the newborn:

Housing, clothing, bathing, feeding, general hygiene, prevention of morbidity and mortality, prevention of infection, care of skin, etc.

C. The child under one year:

Development, feeding, clothing, housing, general hygiene, habit formation, prevention of contagion, prevention of morbidity and mortality.

D. The preschool child:

Organized play, preventive inoculation, diet, habit formation, general hygiene, instruction, discipline, prevention of morbidity and mortality, congenital defects and their treatment.

E. The school child:

Organized play, habits, education, discipline, diet, hygiene, sex education, general survey for physical defects, general survey for tuberculosis, recheck of immunity to preventable contagious diseases.

F. Adolescence:

The psychologic problems, mental hygiene, social adjustment, discipline, organized athletics, selection of future business or profession, prevention of morbidity and mortality.

It will be noted that the above program contains nothing referring to *cure* of disease. The treatment of disease should not be broadcast to the lay public. It leads to erroneous diagnosis and brings discredit on the medical profession.

The subject of treatment should be stressed in groups made up largely of general practitioners. Nothing sustains their interest so much as specific treatment of disease.

REPORT OF BUSINESS MEETING OF REGION II OF THE AMERICAN ACADEMY OF PEDIATRICS

The business meeting of Region II was held in St. Louis, Mo., Nov. 19, 1935, with Dr. E. C. Mitchell presiding. Sixty-seven members attended, and all the state chairmen from the fourteen states were present for the first time since the organization of the Region.

A brief review of the progress of the Academy in this region during the past year was given by the regional chairman. It was requested particularly that applications for membership be made out properly at least six weeks prior to the meetings of the Executive Board in November and June.

Prior to the meeting a letter was sent to each state chairman asking that his report embody the answers to the following questions:

"What new activities have been initiated in your state?

"How are the old activities progressing?

"Are you having any difficulties?

"How are the other child health organizations functioning?

"Are they coordinating with the Academy?

"Do you feel that some of the child health activities in your state are not productive of good results?

"Is your program so constituted that it gives the various members of the Academy some activity to hold their interest?

"What children's hospitals have you in your state?

"Have you any that have been recognized for residency by the Committee on Hospitals as recently published in the JOURNAL?

"Are you satisfied with the pediatric records now in force in your hospital?"

Each state chairman gave a complete report. After the reading of the reports and a full discussion, the following matters were considered under the head of new business:

1. It was moved and seconded that it is the sense of the majority of our members that there should be some form of certificate of membership issued. All members voted in affirmative.

2. It was moved and seconded that the membership of the Academy in this region be restricted to men limiting their work to pediatrics. All members voted in affirmative.

3. It was moved and seconded that there should be an associate membership similar to the one formerly in vogue for men interested in, but not limiting their work to, pediatrics. After much discussion, the motion was tabled.

4. A motion was made and seconded that a committee of one member from each state investigate hospitals and hospital records, in their respective states and report next year. This motion was carried, and Dr. Wilburt C. Davison, Durham, N. C., was made chairman of the committee; he was to appoint the membership.

5. It was moved and seconded that a committee be appointed to draft resolutions on the death of Dr. Morgan Smith, Little Rock, Ark. This motion carried, and Dr. A. C. Kirby, Little Rock, and Dr. Ralph Bowen, Oklahoma City, were appointed to draft such resolutions.

6. It was moved and seconded that a resolution be adopted thanking the Southern Medical Association for its assistance in making the joint meeting of Regions II and III of the American Academy possible, also for the publicity given to this meeting by the Southern Medical Association. The motion was passed unanimously, and the chairman of Region II was designated to notify the secretary of the Southern Medical Association, Dr. C. P. Loranz.

7. A resolution was received from the Chicago Pediatric Society relative to the endorsement by the membership of the Academy as individuals of Dr. Isaac

A. Abt as the next president of the American Medical Association. This was received with enthusiasm.

Chairman Mitchell.—It is very gratifying to find all the state chairmen present for the first time since the organization of Region II. Each state chairman has reported definite progress. The reports would seem to indicate that while in the main the difficulties encountered are quite similar for all states in Region II, each state has a little different problem to meet. By coming together as we have today we can do more toward coordinating our work. Every year we have seen definite improvement.

Some of our chief difficulties come from antagonism from the local state medical societies and from the local health authorities. These difficulties will be entirely ironed out when there is better understanding. The motive of the Academy should be similar to that of the Rotary Club, "Service Before Self." When we can demonstrate to the older and more established organizations that the Academy is organized for the purpose of furthering child welfare, educating better pediatricians, assisting in any educational movement in pediatric education of the profession in general, that the motives of the Academy are entirely altruistic, that we as members of the Academy are willing to act as members of all committees and organizations already established, much of the prejudice will be eliminated.

Several years ago the members of Region II of the Academy and the health commissioners of all states and most of the large cities of the South had a very enthusiastic meeting. Many plans were instituted which did not materialize after the enthusiasm died down, but I still feel that the meeting was productive of good as it gave the health authorities an insight as to the purpose of the Academy; as a result there has been mutual cooperation in Region II.

I should like to comment further that any state in this Region having a good child health program is accomplishing satisfactory results regardless of whether this program is under the Academy auspices.

The American Board of Pediatrics has but one aim—the certification of physicians specializing in pediatrics. This certificate is based on the training and professional attainment of the applicant. The members of the American Board of Pediatrics were appointed jointly from the Pediatric Section of the American Medical Association, the American Pediatric Society, and the American Academy of Pediatrics. The American Academy of Pediatrics is no more an integral part nor has any more voice in the conduct of the Board than have the other two societies mentioned. The expenses incurred by the Board are entirely separate and in no way dependent on the revenue from the Academy. The only connection is that after July 1, 1937, a certificate by the Board will be required of all applicants to the Academy.

As to the opinion that the state chairmen should be elected by the state membership instead of being appointed by the national officers, I believe this could be easily granted. The state chairmen were appointed first from the charter members at the organization of the Society. Many of them still hold that office. In the event of a change the new chairman has been recommended by the regional chairman and the regional board. Speaking as regional chairman, I would be only too delighted to be governed by the members of the state in making this recommendation.

I have always felt that the success of Region II depends entirely upon the organization in each state and upon the industry and ability of the state chairman to control his individual state. As this finishes my four-year term, I wish in closing to thank the state chairmen and the members of this Region for their hearty cooperation and to assure them it has been a pleasure to serve to the best of my ability.

Reports of State Chairmen

Alabama.—State chairman, Dr. Clifford L. Lamar; members of the Academy, 11; pediatricians limiting their work, 23.

All of the Academy members in Alabama with the exception of two live in Birmingham, and so far we have not attempted any organized activity. We are not aware of any work to be done at the present time without financial backing far beyond our means. What we have attempted to do was to acquaint the various agencies who received children with the fact that we are here, and both able and willing to serve. About a year ago we called a meeting in Birmingham of the Department of Public Welfare, the Transient Bureau, and the Red Cross and told them who we were and what we could offer them. The meeting was successful as far as it went. The other agencies represented knew us through our representation as individual members on their boards. When the map showing infant mortality was sent out by Dr. Eliot, I immediately went to Montgomery to the State Department of Health with it and asked them to locate the responsibility. They checked over their reports and said that the chief difficulty appeared to be in the obstetrical field, a statement which I felt lifted the opprobrium from our specialty. When the federal government suggested the possibility of aid in the state health work the Department of Health called a meeting in Montgomery of all of its workers to acquaint them with the problems. This meeting was held last summer and a committee from the Academy attended and offered its services. Six of the "refresher courses" in pediatrics were given in Alabama during the summer months. The State Medical Association shared the expense with the Children's Bureau. We feel that the Academy has too few members to attempt any activity as an association and that we can serve best as a reference bureau for the various agencies who have child health problems.

Arkansas.—State chairman, Dr. A. C. Kirby; members of the American Academy, 4; pediatricians limiting their work, 5.

The first active work was initiated last April at the meeting of the State Medical Society when Dr. Morgan Smith, then state chairman, organized the State Pediatric Society. This society admits all members of the State Society in good standing who are interested in pediatrics. There were 46 present at this meeting. Dr. Morgan Smith was elected president; Dr. A. C. Kirby, vice president; and Dr. Madeline Melson, secretary-treasurer. Unfortunately, Dr. Morgan Smith died this last year. There were no further activities until there was a second meeting in Little Rock, November 1, attended by members of the Academy in the state, and Dr. C. G. Grulee, secretary, and Dr. E. C. Mitchell, regional chairman, of the Academy. It was decided at this time to have a program given under the auspices of the State Medical Society and the State Pediatric Society beginning April 28, 1936. The program will be as follows: three papers of one hour each in the morning—the first on immunity and contagion; the second on diseases and accidents of the newborn; and the third on tuberculosis in childhood. These papers are to be followed by a luncheon with round table conferences at which the three essayists will lead the discussion. Speakers are to be announced later. At the same time there will be a business meeting of the State Pediatric Society to determine a program to be presented for the approval of the State Medical Society and the State Health Department.

Florida.—State chairman, Dr. W. W. Quillian; members of the Academy, 10; pediatricians limiting their work, 18.

Florida reports the first meeting of the newly organized State Pediatric Society (membership open to all members of the State Society interested in pediatrics) will be held concurrently with the annual meeting of the State Medical Association in May, 1936. Practically all eligible pediatricians in the state are interested in the regional program and are enthusiastic. Difficulty has been encountered in coordinating efforts for child health activities on account of the widespread geographic distribu-

tion of the Academy members. The policy has been to encourage local activities in the larger cities of the state under the supervision of the pediatricians in these centers. In Tampa Dr. George Cook, with the assistance of Dr. Martin and Dr. James Cowart, has arranged a program for the year. In Jacksonville Dr. Luther Holloway and Dr. Thomas Buckman are attempting lay education toward periodic physical examinations of the well child, and have arranged flying squadrons of teams consisting of recognized pediatricians, obstetricians, and public health officials who have addressed various mothers' clubs and Parent-Teacher organizations. At Miami effort is being made by the Academy group to provide a place for the proper training of the backward and mentally deficient child. The Dade County Parent-Teacher Association is assisting in an effort to obtain diphtheria immunization for all preschool children. Education of the medical group has been attempted through the medium of the extension course given under the auspices of the State Medical Association at Gainesville in June. Dr. Horton Casparis delivered a series of lectures and informal discussions during a week of varied activities. Preventive pediatrics was stressed. Attendance consisted of physicians from the entire state, and an average of two hundred were present at this meeting. A permanent committee for the study of maternal and infant mortality has been selected from the State Medical Association. No funds are available for a study of this problem from the viewpoint of the pediatrician. It has been felt that more can be accomplished at present by assistance to existing agencies for the improvement of child health than by organization of independent groups without proper financial backing to accomplish an extensive program. The pediatricians of this state are accomplishing a great deal in education of laymen to the value of preventive care and the consequent improvement of child health. The majority of Academy members in Florida feel that membership should be composed of competent men who are limiting their work to pediatrics, and that some form of certification should be granted in recognition of this membership.

Georgia.—State chairman, Dr. M. Hines Roberts; members of the Academy, 16; pediatricians limiting their work, 38.

Georgia has the most complete and satisfactory program, through the organization of County Councils and Child Health and Welfare Councils, of any state in this region. This state also has a very active State Pediatric Society which presented the following program in December, 1935:

AFTERNOON SESSION—

The Medicinal Fish Oils—Dr. Charles E. Bills, director, Research Laboratory Mead Johnson Co., Evansville, Ind.

The Thymus Delusions—Dr. John Lovett Morse, Emeritus Professor of Pediatrics, Harvard University Medical School, Boston, Mass.

The Progress of Infant Feeding—Dr. Isaac A. Abt, Professor of Pediatrics, Northwestern University Medical School, Chicago, Ill.

EVENING SESSION—

Address of Welcome—Dr. Edgar D. Shanks, president of Fulton County Medical Society

Response to Address of Welcome—Dr. Mercer Blanchard, President-Elect of the Georgia Pediatric Society

Infection, Immunity, and Vaccination in Acute Anterior Poliomyelitis—Dr. John A. Kolmer, Professor of Medicine, Temple University, Philadelphia, Pa. Introduction by Dr. Geo. F. Klugh, Jr.

Diagnosis and Prognosis in Pediatrics—Dr. John Lovett Morse

The Multiple Nature of Vitamin D.—Dr. Charles E. Bills

A Child's Heart in Avitaminosis—Dr. Isaac A. Abt

As the Georgia report has already been published in the JOURNAL no further presentation will be made at this time.

Kentucky.—State chairman, Dr. Philip F. Barbour; members of the Academy, 10; pediatricians limiting their work, 13.

The Kentucky members of the Academy have been quite active during the past year. We hold a postgraduate course each spring, one day a week for ten weeks, for general practitioners who are within driving distance of Louisville. The lectures and demonstrations of all kinds are held in the Children's Free Hospital, giving the doctors an opportunity of seeing the new hospital methods of treatment. At our request the Children's Free Hospital also allows any doctor in the state to spend a day or week in the hospital wards without charge. We are also having teams of two pediatricians go out through the state to make contacts with the various women's organizations, to make health talks before the luncheon clubs, and to hold clinics and round table conferences with doctors in the district. These have been very favorably commented upon wherever the teams have visited. We are planning for many more of these the coming year. In addition, of course, there are many of the various county societies before which members of the Academy have presented papers. These more formal affairs do not seem to have been as successful as the other type of talks. I have been in quite close contact with our able secretary of the State Board of Health, Dr. McCormack, in formulating plans for the Social Security set-up. These are now showing definite shape, and when the General Assembly has approved the plan, the various members of the Academy will be used as much as possible in this work. There are a good many men in the state who report themselves as doing pediatric work, and we are trying as far as possible to affiliate with them. However, nearly every man who limits himself to pediatrics is a member of the American Academy of Pediatrics.

Louisiana.—State chairman, Dr. Robert A. Strong; members of the Academy, 18; pediatricians limiting their work, 28.

Louisiana has an active Pediatric Society composed of all members of the State Medical Society interested in pediatrics, as well as pediatricians, which has been in existence for several years.

As no report has been received from the state chairman the activities of the Academy in this state cannot be given in detail.

Mississippi.—State chairman, Dr. N. C. Womack; members of the Academy, 6; pediatricians limiting their work, 10.

The State Pediatric Society of Mississippi held a called meeting on November 6, 1935, at which the executive officer of the State Board of Health was present. After a general discussion of the best methods of promoting child welfare in Mississippi, the following resolutions were adopted:

1. The Mississippi State Pediatric Society and the Mississippi State Board of Health will seek the approval and cooperation of the Mississippi State Medical Association in putting on a two-year program in maternal and child welfare, conducted by a pediatrician of outstanding ability. This program is to be put on in every county in the state, similar to the one now being conducted in obstetrics under the supervision of the State Board of Health. A committee from the State Pediatric Society was appointed to cooperate in developing this program.

2. In cooperation with the State Board of Health and under the control of the State Board of Health, the same groups will work for the development of the county-unit plan, which is at present in operation in Washington County, and which is operated principally through the local Parent-Teacher's Association. This is a year-to-year campaign with a definite program of prenatal, natal, and postnatal education of the mother; immunizing all preschool children against infectious diseases, general lectures on child health, nutrition, etc.

The State Pediatric Society, through their individual members, are cooperating in every way in their local communities to promote the cause of child welfare in all its phases.

North Carolina.—State chairman, Dr. Aldert S. Root; members of the Academy, 18; pediatricians limiting their work, 30.

On June 27, 1935, Dr. George M. Cooper, director of the maternal and infant welfare work of the State Board of Health, acting as special agent of the United States Children's Bureau, called a meeting of certain pediatricians, obstetricians, and general practitioners in order to discuss a maternal, prenatal, infant, and child health program, which was to be submitted to Dr. Martha Eliot for approval, in order that North Carolina might obtain its quota of funds from the Daughton Bill.

After a general discussion of the subject a committee of four was appointed to submit a definite plan to Dr. Eliot for her consideration: this committee, Dr. T. L. Lee, Dr. Bayard Carter, Dr. H. H. Johnson, and Dr. A. S. Root, outlined a plan as follows:

A Plan for the Reduction of Maternal and Infant Mortality in North Carolina

1. The employing of a full-time competent obstetrician and pediatrician.
   The duties of these men shall be:
   a. To conduct postgraduate courses in obstetrics and pediatrics for physicians.
   b. The obstetrician to instruct midwives in caring for normal cases and to recognize gross abnormalities.
   c. In conjunction with local health departments to supervise prenatal and infant welfare clinics.
   d. To conduct public meetings on maternal and infant welfare.
2. The local county medical society must approve the plan and pledge its support before any activity is started in that particular county.
3. All prenatal and infant welfare clinics to be organized by local county medical societies in conjunction with local county health departments. All physicians in county to be invited and urged to take part in these clinics. The obstetrician and pediatrician employed by the State Board of Health to act in an advisory capacity only. The clinical material in these clinics to be utilized for postgraduate instruction as said obstetrician or pediatrician may see fit.
4. The employing of public health nurses trained in social service work where these clinics and postgraduate courses are organized. The duties of these nurses shall be to instruct mothers, to get them to the clinics, to follow up the cases, and to disseminate information concerning maternal and infant care.
5. The obstetrician and pediatrician employed by the State Board of Health shall report their activities each month to the committee.
6. As soon as the plan is in operation, an extensive publicity campaign on maternal and infant welfare is to be put on. This to include both newspaper articles and radio programs prepared by the State Board of Health and the obstetricians and pediatricians of the state.
7. An effort shall be made to set aside a small sum of money for necessary drugs, sundries, etc., to carry on this work.
8. Realizing that to reduce materially the high maternal and infant mortality in this state some means must be provided for early hospitalization of complicated cases, the State Board of Health, this committee, and the president of the North Carolina Medical Society will make every effort to make funds available to carry out this section of this plan for the reduction of maternal and infant mortality in North Carolina. If and when these funds are available for hospitalization, the patient is to be intimidated in no way by anyone connected with the administration of the fund or anyone connected with any clinic.

When funds are available and the actual work begins, the members of the American Academy of Pediatrics in the state will share the work of carrying it out.

Oklahoma.—State chairman, Dr. Clark H. Hall; members of the Academy, 14; pediatricians limiting their work, 16.

Since July 1, the new health commissioner of Oklahoma has instituted children's clinics over the state. These are general, including physical examinations and immunization. His force is limited, but he hopes to add to this with an increased grant of funds. The Oklahoma Society for Crippled Children, a state organization, is doing excellent work. During the year of 1934 there were nineteen clinics held in various cities over the state with a total of 717 children examined. Many of these children were referred to hospitals for treatment. The expenses of the society are paid by a state appropriation and membership fees. A full-time secretary is employed. By state law, the commission is authorized to cooperate with the federal authorities and to do all things necessary to entitle the state to receive the benefit of such provisions as Congress may enact for such purposes. The Academy has not had a specific program this year. Every member is cooperating in carrying on the following work. The last legislature passed a law whereby any child whose parents cannot afford medical treatment can be sent to a hospital at the expense of his county. These hospitals must be approved by an appointed committee. There are nine hospitals in the state that have been approved as capable of handling such cases. Each staff man who is to take part in this work must be approved by the committee. He must devote at least a major portion of his time to this specialty. The proper papers are filled out and sent to the county judge. He then sends the child to one of the approved hospitals for hospitalization. The hospitals receive a certain sum per day. There is one strictly Children's Hospital in the state, the Hospital for Crippled Children, which is operated as a part of the University of Oklahoma Hospital and Medical School. It has a capacity of 200 beds, and the convalescent home has a capacity of 50 beds. The hospital is general, but a large portion of the beds are designated for orthopedics. The resident spends six months in this hospital and six months on medicine in the general hospital. It is approved by the American Medical Association as such. Our members have expressed the opinion that there should be some form of certification. It is our opinion that the membership of the Academy should be composed of men who limit their work to pediatrics entirely. If not, then the Academy would cease to be of as great value to the men limiting their work. We are not in favor of a classification for anyone other than pediatricians. The State Pediatric Society should take care of all those with a major interest in the specialty.

South Carolina.—State chairman, Dr. D. Lesesne Smith; members of the Academy, 8; pediatricians limiting their work, 15.

South Carolina has an active Pediatric Society, the membership composed of men limiting their work to pediatrics, though it is my understanding that the meetings are open to all members of the State Society who are interested in this branch.

The Academy group in South Carolina has been quite active, but owing to the fact that up to the present time no report has been received from this state we are unable to report activities in detail.

Tennessee.—State chairman, Dr. Horton R. Casparis; members of the Academy, 23; pediatricians limiting their work, 36.

Tennessee has an active Pediatric Society, which has been in existence for four years. The membership is composed of all men in good standing in the State Medical Society who are interested in pediatrics. A program, which is essentially practical and very interesting, is given each year for the general practitioner as well as the specialist. This year in Memphis there will be a clinical feature added. At luncheon there will be a session of the American Academy to which all members of the State Pediatric Society are invited and where there will be a discussion of the various child health problems.

A position of director of child health for the State Department of Health has been created and will function in the very near future. The various child health organizations of the state are attempting to coordinate their activities under the super-

vision of the members of the State Pediatric Society. The local health departments in the large cities, particularly Memphis, have been quite active, owing to the high infant mortality rate reported by the Bureau of Census. A recent survey was made by Dr. Ella Oppenheimer of the Department of Child Welfare under the Department of Labor. This survey was quite complete. A thorough analysis was made, and many health suggestions emanated from this report. These suggestions have been taken into consideration by the local health department and will be carried out. We hope to report more progress within the next year.

Texas.—State chairman, Dr. Edwin G. Schwarz; members of the Academy, 36; pediatricians limiting their work, 72.

Letters have been written to all members of the Academy in Texas, encouraging them to carry preventive pediatrics and child health information to the various medical societies. It has been suggested that the pediatric departments of the University of Texas and Baylor Medical College foster an educational program. The services of the Academy have been offered to the state health officer and to the president of the Federation of Women's Clubs of Texas, and the services of the Academy members offered for any health program. At the Third Conference of Child Health and Protection the state chairman acted as chairman of the medical section. Through the secretary of the State Medical Association, together with the state health officer, we have outlined a plan for pediatric instruction throughout the state under the Social Security Act. A meeting of the state group was held at the fall meeting of the Texas Pediatric Society, which about twenty members attended and at which we were honored by the presence of Dr. Grulee. At this meeting it was the consensus of opinion that no reduction in membership requirements be made and that the executive committee, through the regional chairmen, supply each member with a report on the anticipated activities to be brought up at the following annual meeting in order that those in attendance be better qualified to act on these new activities.

Virginia.—State chairman, Dr. J. B. Stone; members of the Academy, 18; pediatricians limiting their work, 30.

During the past year the Department of Clinical and Medical Education of the Medical Society of Virginia in conjunction with county medical societies has sponsored five postgraduate courses in pediatrics in widely separated parts of the state. Three of these were under the leadership of Dr. George M. Lyon, Huntington, W. Va., and two were under the leadership of Dr. Samuel F. Ravenel, Greensboro, N. C. These courses were well received by the local physicians and considered a success in every way. Both the University of Virginia and the Medical College of Virginia have continued their practice of giving short postgraduate clinics each year. The St. Phillip Hospital Post-Graduate Clinic for practicing colored physicians has been held each summer at the Medical College of Virginia for the past five years. The Bureau of Child Health of the State Department of Health has been very active in promoting the "Five-Point Program" among school children, as a minimum standard of physical fitness. Leading up to this, much work has also been done on the "Beginner's Program" in an effort to have all preschool children examined, preferably by their family physician, and remediable defects corrected before entering school. This bureau has continued to wage an active campaign against diphtheria, and strenuous efforts have been made to increase the number of immunizations by family physicians and in clinics. The State Department of Education, realizing the need for more and better instruction regarding infant and maternal hygiene, has included a health unit in its revised curriculum. This unit stresses the importance of proper infant care and the necessity for a healthful and sanitary environment. Last year a booklet, *Health Survey of Virginia's Children*, was prepared and published under the direction of the State Committee of Child Hygiene of the Cooperative Education Association, Virginia Branch of the National Congress

of Parents and Teachers. This survey discloses many facts regarding present conditions and should be of tremendous usefulness in making an attack on existing problems. Last April the State Child Conservation Committee was formed, the purpose of which is to coordinate the activities of the various state-wide organizations concerned with the promotion of child health. This committee is composed of the Child Hygiene and Child Welfare Committees of the Medical Society of Virginia, the Virginia Pediatric Society, the Virginia Tuberculosis Association, the Cooperative Education Association, and the State Superintendents' (of schools) Association. At the organization meeting of the group, committees were appointed to make a study of the following subjects, and make recommendations.

1. Appropriations for a continuous postgraduate service to Virginia doctors.
2. Pro rata appropriations for indigents from state and counties for local hospitalization for specific needs.
3. Pro rata appropriations from state and counties for correction of vision in indigent children with special reference to the use of local specialists.
4. Pro rata appropriations from state and counties for correction of teeth in indigent children.
5. Pro rata appropriations from state and counties for immunization of indigent children.
6. State appropriation for specific drugs furnished physicians for treatment of all cases of venereal disease.
7. Appropriations for a tuberculosis control program with especial reference to pneumothorax.

The Academy is well represented on these committees, and some of its members are engaged in furthering the work of the organization.

The Academy as a unit has made very little headway in Virginia. It has been quite difficult to get the members of the Academy together and to have them look on the Academy as their own organization in which they are an integral part; the trend has been for them to expect the Academy to do something for the members instead of their doing something for the Academy.

There has been, among other things, some complaint of the Academy dues. A number of the members seem to identify the Academy with the American Board of Pediatrics and express dissatisfaction with the latter and with the Academy as a part of the Board. Their contention is that membership in the Academy should in itself constitute certification of pediatric competence which should be evidenced by a certificate of membership issued by the Academy. They think that the fee for certification by the American Board of Pediatrics is unjust and that this should be covered by the dues paid to the Academy.

The opinion has also been expressed that the state chairman should be elected by the state members instead of being appointed by the National Officers, and they look on this appointment as an infringement on local self-government.

The Pediatric Society has been somewhat loosely organized in the past, and its meetings held at a brief luncheon period once a year have not given adequate time for matters that should be considered. But at its meeting in October a partial reorganization was effected, and it was decided to hold an additional all-day clinical meeting each spring. It was agreed that a short period of time would be set aside at this spring meeting each year for discussion of Academy activities.

West Virginia.—State chairman, Dr. J. Lewis Blanton; members of Academy, 9; pediatricians limiting their work, 19.

One year ago the West Virginia Pediatric Society, a section of the West Virginia Medical Society, was called in special session by members of the Academy to formulate plans for a state child welfare program. A summary of the proposals approved at this meeting was presented to the West Virginia Medical Society at its annual meeting in May of last year. This led to the appointment by the State Medical

Society of a child welfare committee and a maternal welfare committee. These committees have been active during recent months developing plans for a state program of child and maternal welfare. Full cooperation with existing health and welfare agencies has been maintained. So far, the program has consisted in laying the foundation for future efforts and stressing the educational side of child and maternal welfare through various means of publicity. A program of postgraduate education for the rural practitioners of the state is being developed for the coming year. These committees are also working out the details for a state program for child and maternal welfare under the provisions of the Social Security Act. Individual members of the Academy have been quite active in their respective communities. Dr. George M. Lyon has developed a school health program for Cabell County, which is receiving favorable comment from many national organizations interested in child welfare. Dr. Holland and Dr. Blanton have given a series of health talks over the radio on preventive pediatrics. These talks have been given under the auspices of the Marion County Medical Society and have stressed particularly early immunizations. Dr. Andrew Amick is chairman of our State Child Welfare Committee. Dr. Russell Bond, Dr. A. A. Shawkey, and Dr. Raymond Sloan are Academy members on this same committee. West Virginia, because of the large mining population, presents many difficult problems for the committees on child and maternal welfare, but we feel confident that these problems can be solved and that much good will come out of the program now being evolved.

West Virginia suffered a real loss when Dr. R. C. Hood was appointed director of the Crippled Children's Division of the Children's Bureau in Washington, Dr. Hood was one of the most energetic pediatricians in the state. His interest in the pediatric activities of our state, and his wise counsel, will be greatly missed. However, the peditaricians of the nation can be assured that the Crippled Children's Division under the Social Security Act will be well administered.

Academy News

Dr. D. B. Leitch, of Edmonton, has accepted the chairmanship for the Province of Alberta.

Dr. Howard Spohn, of Vancouver, has accepted the chairmanship for the Province of British Columbia.

Information has just been received that Dr. Carl K. Wagener, of Pittsburgh, died Feb. 26, 1935.

The next annual meeting of the Academy will be held at Kansas City, Mo., on May 11 and 12 preceeding the meeting of the American Medical Association. Headquarters for the Academy Meeting will be the President Hotel.

News and Notes

The **Fourth International Congress of Pediatrics**, which was scheduled for this spring in Rome, has been postponed until the latter part of September, 1936.

Book Review

Mechanics of Normal and Pathological Locomotion in Man. ARTHUR STEINDLER, M.D., F.A.C.S. Professor of Orthopedic Surgery, the State University of Iowa, Iowa City, Iowa. Charles C. Thomas, Springfield, Ill., and Baltimore, Md. Price, $8.00.

The author presents a very detailed and well reasoned summation of the normal and pathologic mechanics of the human body. It is primarily intended for the use of those who, as orthopedic surgeons, must treat severe deformities resulting from injuries, congenital anomalies, or advanced pathologic derangements of body mechanics; but it will repay careful study by those who, as pediatricians, need a clearer understanding of the mechanical forces acting within and upon the body as a basis for teaching correct posture and efficient use of the body to normal children. The first group will, no doubt, find it necessary and profitable to understand the extensive mathematical and physical formulas used as proof of the explanations given, but no one should be deterred from careful reading of this book by the simpler process of accepting the author's conclusions with the assumption that his mathematical illustrations are sound. These conclusions are so clearly stated and the illustrations so numerous and well done that they are in themselves a veritable storehouse of practical knowledge.

For example, one with but a rudimentary knowledge of mathematics and physics can readily understand and be greatly enlightened by Dr. Steindler's description of the process by which the human body, all of whose movements are about articulations and are therefore rotary movements, can transpose these purely rotary movements into translatory motions.

"When rotation of a body occurs about a single point fixed in space, for instance in the case of a pendulum or wheel, the result can never be anything but a rotatory movement. Now let us combine two such rotatory movements of a member of the skeletal structure by causing it to rotate alternatingly about both ends. For the sake of illustration we shall take a straight rod and imagine that it turns successively first about one end and then about the other. If the rod is rotated about its lower end, it will swing forward at a certain angle, the same as a swinging pendulum. Let us now imagine that it stops at the end of the swing and that it thereupon proceeds to rotate about its upper end and that it now describes the same arc about the upper end while the lower end remains free to swing forward. The result of these two rotatory motions is that the position of the rod at the end of the second rotation is exactly parallel to that of the starting position, but it has been brought forward by a certain distance." (Page 19.)

"So we see that combinations of two or more rotatory motions can be arranged to result either in a translatory progression, if the angles are equal and opposite, or in the summation of the rotatory effect, flexory or extensory, if the angles are not opposite in direction." (Page 21.)

Likewise, his chapter, "The Center of Gravity," is very interesting, instructive, and important: interesting because of his use of many types of animals for illustrative purposes and his deductions concerning the philogenetic development of posture in animals and man; instructive because of his emphasis upon the necessary development of the extensory muscles of the back, hips, knees and ankles without which upright bipedal posture cannot be maintained; important because without

an understanding of the effects of the force of gravity on the body such as is given here, no one can teach children to make the best use of their muscles and thereby avoid faults of both equilibrium and motion. The following paragraphs on the relation of equilibrium to motion are classical examples of clear thinking.

"Only when the equalization of forces does not take place and resultant forces become active, a loss of equilibrium occurs under the appearance of motion. Thus, it is proper to define: motion is loss of equilibrium.

"In human locomotion the loss of equilibrium does not mean that the individual falls to the ground. On the contrary, it is part of the scheme of locomotion that loss of equilibrium is promptly followed by another period in which equilibrium is regained to the extent of preventing the fall of the body. That means that the threatened fall is intercepted by new forces which are created by additional muscle action for this specific purpose. Then recovery of equilibrium is again followed by a phase in which it is destroyed. We may therefore define locomotion as a rhythmic play of muscle forces between loss and recovery of equilibrium." (Page 32.)

Space does not permit too detailed a review of this excellent monograph, but I cannot forbear quoting at length from the chapter, "The Spinal Column."

"Why is the human spine not a straight rod but a quadruple curve? The curves are the result of developmental changes the spine has undergone from its early embryonic phase to the state of complete adult formation. In the latter half of embryonal life the spine shows only one single curve with a posterior convexity, the curve reaching from the occiput to the pelvis. This is the configuration of the spine in the newborn. In the adult, however, the spinal column has taken on several curves, alternating with each other in converse direction.

"The first of these curves appearing additionally to the embryonal curve is the lordosis of the cervical spine. It develops as the head is being held erect when the child attempts to enlarge its horizon of vision.

"The second curve develops by lordosing of the lumbar spine when the child begins to sit up and later to stand.

"Between the cervical and the lumbar lordosis the dorsal spine retains to a measure its original convexity and one may speak of the normal kyphosis of the dorsal spine.

"The curve which begins at the junction of the fifth lumbar and the sacrum and which includes sacrum and coccyx, has its convexity backward; it is a kyphotic curve.

"There is a great physiological latitude in relative length and degree of these curves. Yet, each curve is compensatory to its neighbor with the result that the line of gravity, as it passes from the supporting base, intersects with all four curves of the spine at a certain level. Owing to this feature of compensation, the spine finds itself generally in line with the line of gravity, in spite of the fact that each curve in itself marks a deflection in anteroposterior direction. The result is a more or less even distribution of the body weight in front and back of the line of gravity.

"The first function of the spine is to maintain upright posture. Clinically, one may describe normal posture as follows: head erect, the eyes look straight forward, the shoulders are square, the chest is well rounded and is carried forward of the abdomen (Goldthwait). There is full extension of the hips and full extension of the knees. The feet are at right angle position to the leg and the toes point straight forward or slightly outward.

"Mechanically, the definition of normal posture is based upon the already mentioned relation of the spine to the line of gravity. Seen in the frontal plane, it rises midway between the heels, strikes exactly the gluteal fold, coincides with all spinous processes of the vertebrae, and intersects with the head at the middle of the occipital bone. In other words, in this plane the line of gravity bisects the body in two symmetrical halves.

"In sagittal projection, that is, viewed from the side, the relation of the line of gravity is as follows: It arises from the supporting surface of the feet between ball and heel, in front of the ankle joint, slightly in front of the knee joint, running directly behind the center of the hip joint, ascends between hip joint and sacrum to cut the upper and anterior portion of sacroiliac junction; then it runs upward behind the bodies of the lumbar spine, intersects the spine at the lumbo-dorsal junction, then runs slightly in front of the dorsal spine, intersects the spine again at the cervico-dorsal junction, runs slightly behind the cervical vertebrae, and finally touches the head immediately behind the ear at the mastoid process." (Pages 120 and 121.)

What pediatrician has not been asked by many anxious mothers, "Is my baby's back deformed?" when she first notices the physiologic lordosing of the lumbar spine described here?

The mechanics of the ankle and the foot and of the gait are especially recommended for careful study, and the mechanics of posture for even closer attention.

I have long noticed that there is a definite relationship between the excessive lumbar lordosis of the Class C posture and marked or excessive shortening of the posterior leg muscles and that correction of the posture fails or proceeds very slowly unless the posterior leg muscles, especially those of the calf, are subjected to vigorous and simultaneous stretching. I have also felt certain that these two conditions, i. e., the lordosis and posterior leg muscle shortening, react one upon the other to form a vicious cycle in progressively bad posture. While I have been certain of this relationship and have used it as a clinical fact with excellent results, it was not until I read Dr. Steindler's explanation, which leads up to his sentence (Page 197): "As soon as the line of gravity wanders in front of the ankle joint, which is the case in the usual normal position, then the calf muscles come under tension; on the other hand, when the center of gravity wanders back of the knee joint, tension is produced in the extensors of the knee," that I clearly understood the mechanics of this fundamental relationship. Likewise, while I have taught, with all my powers, that the military posture is abnormal and should not be used as the "correct" posture, as it is by nearly all directors of physical education, I did not have the firm foundation for my convictions which his excellent explanation has given me, nor did I realize the usefulness of the military posture for its one purpose, namely, that from this position "*a sudden forward movement of the body can best be undertaken.*"

"The so-called military posture is also an incidental upright posture. The thorax is maintained vertically and carried forward; the abdomen is drawn in and the pelvic inclination is increased. The knees are extended. The common center of gravity of the body is thrown in front of the ankle joint and in front of the knee joint, so that tension of the calf muscles and relaxation of the knee extensors occurs. *Lumbar lordosis is accentuated.* (Reviewer's italics.)

"Because in this position the center of gravity of the supra-femoral mass of the body is considerably in front of the common axis of the hip joint, the extensors of this articulation are under considerable tension. This tension still increases if the weight of a rifle held in front of the body further transposes the line of gravity forward. This is not a rest posture by any means; it is a posture of attention out of which, due to the tension of the gluteals and calf muscles, a sudden forward movement of the body can best be undertaken." (Pages 197 and 198.)

If these two paragraphs alone could be instilled into the minds of all educators, this book would take a high place in the literature on this subject, and would save millions of children from the misconceptions which are now contributing to the continuation of, and in all too many individuals, an actual exaggeration of an already faulty posture.

C. S.